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May 14, 1956

Professor Ralph E. Freeman
Chairman
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Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Professor Freeman:

In partial fulfillment of the requirements for the degree of Doctor of Philosophy in Industrial Economics, I herewith submit this thesis entitled:

**Put and Call Options: A Theoretical and Market Analysis.**

Respectfully,

Richard J. Kruizenga

Richard J. Kruizenga
PUT AND CALL OPTIONS: A THEORETICAL
AND MARKET ANALYSIS

by

RICHARD J. KRUIZENGA

Hope College

(1952)

SUBMITTED IN PARTIAL FULFILLMENT
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PUT AND CALL OPTIONS: A THEORETICAL AND MARKET ANALYSIS

by

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Submitted to the Department of Economics and Social Science on May 1st, 1956, in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Industrial Economics.

ABSTRACT

This thesis concerns put and call stock options. Chapter I defines and explains the various option contracts; the nature of the contracts is explored, and the possibilities of option conversion are discussed. Chapter II traces the historical use of option contracts from the Seventeenth Century, when they first were used in the Netherlands and England. Until recent years European option trading has been more extensive than American trading. Their use in the United States stems from the middle of the Nineteenth Century.

Chapter III examines the size of the option market; it is small in comparison with exchange trading. Option trading is largely confined to the more speculative stocks, and is heavily concentrated in a few of them. The small market size suggests a thin option market in most issues. Chapter IV analyzes the option market. The identity of option purchasers and writers is discussed. The option dealers are found to be the key figures in the market. The market is not only a highly imperfect one, but there are elements of impurity as well. Chapter V examines speculation via options in terms of the functions speculation in stocks is alleged to perform. Option trading may increase exchange volume and tend to alter the impact of speculation on stock prices. High Federal Reserve Board margin requirements probably stimulate option activity. The Federal income tax treatment of the results of option trading is complicated and in some instances uncertain.

In Chapter VI multiple correlation analysis shows a high correlation between option premiums, stock prices, and the range of stock prices. The regression functions do not prove to be accurate estimators of option premiums when they are applied to different time periods. The profitability of the purchase and sale of options is estimated. The purchasing is profitable and the selling unprofitable. The period studied is believed to be not typical. Chapter VII considers the
expected values of various options, assuming the speculator to have expectations of future prices which take the form of probability distributions. The relationships between the expected values are discussed, as is the manner in which they increase with the length of the option contract. Chapter VIII considers the variance of expected option profits. The variance is of importance in option trading and essential to the explanation of the behavior of some writers. Some implications for asset-preference theory are suggested.

Thesis Supervisor: Paul A. Samuelson
Professor of Economics
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It would be folly, as well as unjust, if I did not mention my wife, who actively encouraged me and whose efforts on behalf of my work were considerable.

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CHAPTER I

INTRODUCTION: THE NATURE OF THE OPTION CONTRACT

"Puts" and "calls" are optional time transactions in speculative media. A put is an option to sell and a call is an option to buy. These contracts can be written on commodities or securities; this study is concerned with those written on securities.¹ The present put-and-call market is an adjunct to the regular securities markets, and it is in this market that those interested in buying or selling options on securities may do so. This chapter will be devoted to a discussion of the nature of the product dealt in in the put-and-call market.

A put is an option to sell. As it is traded in in the present market it gives its holder the privilege of selling to (or putting to) a second party a fixed amount of some stock at a stated price on or before a predetermined day. Similarly the call is the option to buy. It gives its holder the privilege of "calling" from a second party a fixed amount of some stock at a stated price on or before a predetermined day. The subject of the option agreement is almost always corporate common stock, but preferred stock and corporate or government bonds occasionally appear on options.

The standard form of the call contract reads:

¹While "warrants" and "rights" are forms of options, they are not treated in this study. Neither are the so-called "incentive" options given to executives of corporations.
New York, [February 14, 1956]

For value received, the Bearer may CALL ON ENDORSER for ONE HUNDRED (100) shares of the Common Stock of the United States Steel Corporation at Fifty Dollars per share (($50.00)) ANY TIME in 90 days from date. DURING THE LIFE OF THIS OPTION, THE CONTRACT PRICE HEREOF SHALL BE REDUCED BY THE VALUE OF ANY PAID DIVIDENDS AFTER THE STOCK GOES EX-DIVIDEND ON THE EXCHANGE.

Expires [May 14, 1956]
3:00 P.M.

Signed -- Filer Schmidt and Co.

Endorsed on reverse side -- Merrill, Lynch, Pierce, Fenner, and Bean.

The endorser is the broker of the party selling or "writing" the option, and he must be a member of the New York Stock Exchange. The signer is the option dealer through whom the transaction has been made. When duly signed and endorsed, the contract is negotiable. Thus a call is a security in and of itself, and can be traded in as such.

2Put and Call Brokers and Dealers Association, Inc., Put Option and Call Option Contracts (New York), Revised Second Edition, p. 3. (Hereinafter in any references to the booklet, it will be cited as Association, Option Contracts.) For completeness of description, the following statements which are found on the standard contract form should be mentioned: "This contract must be presented to the cashier of the firm it is endorsed by, before the expiration of the exact time limit. IT WILL NOT BE ACCEPTED AFTER IT HAS EXPIRED AND CANNOT BE EXERCISED BY TELEPHONE." "The undersigned [the option dealer] acts as intermediary only, without obligation to the holder hereof, who accepts this option upon such understanding." "Delivery on C.H. Sheet of N.Y.S.E. or according to S.E. usage." It is stated in two places that the contract was sold by a member of the Put and Call Association. On the reverse side: "Where the stock covered by Put or Call option is entitled to rights and/or warrants during the life of the option, the contract price specified in the option shall be reduced by the value of such rights and/or warrants as fixed by the first or opening sale thereof on the date when the stock sells ex-rights and/or ex-warrants on the Exchange or principal Exchange where same are dealt in; and such rights and/or warrants shall not be transferred upon the exercise of the option." On a call contract, but not a put, there is a place for the affixing of federal and state stamps.
The standard form of a put is identical to that of a call, except that it reads "DELIVER TO ENDORSER" instead of "CALL ENDORSER for" and it bears no stamps. 3

There are several dimensions to an option contract. First there is the amount of stock to be covered by the agreement. The basic unit of trading is 100 shares or a multiple thereof, with exceptions being very rare. A second dimension is the time duration of the contract. This can vary from a few days up until a year or longer. Very few contracts are written for 30 days or less, the 60 and 90 day and the six month and ten days 4 contracts being the most popular. The shorter 30-day contracts were the customary ones twenty years ago, but they have since lost favor. A third dimension of the option is the specified price at which the transaction is to be made. The usual practice today is to write the paper, or contract, "at the market," i.e., at the price ruling on the stock exchange at the time the agreement is reached. However there are papers, such as the thirty-day ones, that are written "away from the market," and these are known as price-differential options. The fourth dimension of the contract is the consideration given for it: the premium. The premium is usually the market-determined variable, but in the case of such as the thirty-day options, the premium is fixed (at $137.50 for a thirty day paper). In these other cases the market-determined variable is the "distance from the market," or the amount the contract

3 Ibid.
4 The ten days are added because of the personal income tax short-term, long-term distinctions.
price varies from the market price. These many dimensions introduce considerable complexity into option dealings.

The put and the call are the principal options in the present-day market, but there are two others which should be mentioned. A straddle is a combination of a put and a call. Both the put and the call have equal "dimensions." The straddle can be split into the two options, each being exercised independently of the other. A spread, formerly called a "spread-eagle," is similar to a straddle but the put side is written at a price below the market and the call side is written above the market. While the straddle is of some importance in today's option market, a spread is rarely seen.

The holder (and also the writer -- the seller of the paper) of an option has a stock market position, i.e., he has an asset (or a liability) whose value at any moment will depend upon the market price of the stock under option. The nature of the position will depend, of course, upon the kind of option involved. An examination of the various positions will shed light on the uses to which options can be put.

Consider, first, the call option. Once having acquired a call, its holder during the period the option runs stands to gain to the extent that the market price of the stock in question is above the price specified in the contract (neglecting commissions and taxes). However, because it is an option he holds, there is no necessity for him to exercise the contract if the market price falls below the contract price. In this case there is no gain from the call, nor is there a loss he must suffer. These various possibilities of profit
at all conceivable prices can be summarized geometrically in a \textit{gain} function, as in Figure 1a. The description of the gains to be had from a call position immediately suggest an obvious use of a call: to profit from an anticipated rise in the price of a stock. This can be termed the \textit{speculative use} of a call. Because of the low cost of the call as compared to the cost of assuming a long position, substantial leverage is obtained in this speculative use. There is also the \textit{insurance use} of a call. If the holder of the call already has a short position, i.e., he has made a short sale in the stock, by purchasing a call he can protect himself from possible short-position loss while not reducing any possible short-position gain. A short position is one which gives a gain to the extent of a future reduction in price or a loss to the extent of any increase in price (it is graphed in Figure 1b). The gains from a call can cancel the losses from the short position. So the insurance use of an option protects the holder against the possible losses involved in a second market position which the holder has assumed.\footnote{In some circumstances it may be difficult to distinguish the insurance from the speculative use of the option. To the extent the distinction is not clear-cut, it is of limited use. Nonetheless, for such statements as, "Most option purchases today are for speculative purposes," the distinction would seem useful and meaningful.}

The pure position of the writer of the call is the negative of that of the holder; what the holder stands to gain, the writer stands to lose. If the price of the stock should go down the option will not be exercised; if it goes up, the option will be exercised and
Figure I. Gain Functions

a. Holder of Call

b. Short Position
the writer stands to lose the difference between the market price and the specified option price. Since there is no limit to the possible market price, there is no limit to the writer's possible loss. The gain function is graphed in Figure 2. The writer must receive remuneration for assuming the risk of these possible losses. This remuneration, or the premium, he receives is the maximum extent of his gain, for from the position alone he can only lose.

The gain function of the holder of a put is graphed in Figure 3a. The paper becomes profitable as the stock market price declines, for the holder can then buy stock at the market price and sell it at the specified option price by exercising his put. If the market price should rise, the put would not be exercised. Used as insurance the put can protect a long position. (A long position, which can be assumed by purchasing stock, profits on higher prices to the extent of the rise and loses to the extent of the fall on declining prices. See Figure 3b.) Its speculative use is to profit from falling prices, and again substantial leverage is present. The pure position of a writer of puts involves losses to the extent of any fall in price below the specified option price, while there are neither gains nor losses if the market price rises. His gain function is graphed in Figure 4.

It is because of the nature of these gain functions that options

---

6It must be kept in mind that neither the consideration given for the option nor that received by the writer is being considered in the gain functions. They merely summarize the possible gains (and losses) that can accrue, once the position in question is assumed.
Figure II. Gain Function, Writer of Call
Figure III. Gain Functions

- a. Holder of Put
- b. Long Position
Figure IV. Gain Function, Writer of Put
exist. These positions, which are natural to options, are very difficult to come by through the use of other trading techniques.\(^7\) And the positions obtained from holding options are clearly desirable ones to have. All non-option positions work in two directions: a profitable one and an unprofitable one. The option buyer is paying, in effect, to have a second party shoulder the burden of the non-profitable aspects of one of the usual positions. So long as there are option writers who are willing to shoulder these burdens at a price the buyer is willing to pay, then option trading will tend to exist.\(^8\)

**Conversion**

An important characteristic of the option position is perhaps at this point self-evident: the **convertibility** of these positions. That is, by making the appropriate market transactions, one kind of option position can be converted, in effect, into another. This convertibility is important; it is impossible to understand option trading and the working of the option market without an understanding of conversion.

If two different market positions are assumed, the net position is a resultant combination of the two. The gain function of the

---

\(^7\)An example of how other trading techniques might be used to duplicate an option position would be the use of a "stop-loss order" to attempt to simulate a call. A later chapter will discuss in detail how well this attempt succeeds.

\(^8\)As will be evident upon reading Chapter II, option trading tends to spring up in financial and commodity markets whenever there is active speculation. There always seem to be persons willing to supply these one-sided contracts.
resultant position can be obtained by adding horizontally the two original gain functions. So when we described how a call could be used to protect a short position (i.e., the possible gains from the call offset the possible losses from the short position), the net resulting possible gains comprise in effect the gain function of a put option. That this is so can be verified by adding Figures 1a and 1b, as is done in Figure 5. Similarly a put combined with a long position yields the gain function of a call option. (Figures 3a and 3b can be added.) Thus a put can be "converted" into a call by buying stock, and the call into a put by selling stock. The straddle, of course, is merely the combination of a put and a call. Its gain function can be derived by adding that of a put and a call. The result is Figure 6a. On the downside the put is profitable, but there are no losses from the call; on the upside the call is profitable, but the put is not unprofitable. Writing a straddle gives the function in Figure 6b. It will be convenient to label any "resultant" position as a synthetic one, as opposed to the original positions which the trader entered into and from which the resultant position was derived. The straddle is a synthetic option when it is composed of separate put option and call option contracts.

There are six market positions which can be considered basic in the sense that by assuming them in various combinations all other positions can be obtained. The six positions stem from holding a

---

9The costs of assuming these positions are being disregarded in the following material.
Figure VI. Gain Functions
call, writing a call, holding a put, writing a put, buying stock, and selling stock. The six basic gain functions have already been graphed in Figures 1a, 1b, 2, 3a, 3b, and 4.

In working through the various possibilities in conversion, it is easier to characterize the six positions by the following vectors rather than by gain functions:  

- Purchasing a call, \[ \begin{bmatrix} 1 \\ 0 \end{bmatrix} \]; purchasing a put, \[ \begin{bmatrix} 0 \\ 1 \end{bmatrix} \];
- Writing a call, \[ \begin{bmatrix} -1 \\ 0 \end{bmatrix} \]; writing a put, \[ \begin{bmatrix} 0 \\ -1 \end{bmatrix} \];
- Purchasing stock, \[ \begin{bmatrix} 1 \\ -1 \end{bmatrix} \]; selling stock, \[ \begin{bmatrix} 1 \\ 1 \end{bmatrix} \].

It is easy to keep the various vectors straight by remembering that the upper numeral indicates how the position fares from upward price movements: a plus indicating possible gains; a minus, possible losses; and a zero, neither. The lower numeral shows in a similar manner how the position fares from downward price movements. The basic unit of trading must be the same for all positions—in stocks it would be 100 shares—and the size of the numeral indicates the number of basic units

---

10 There are actually four basic positions. Taking a long position can be done, in effect, by buying a call and writing a put simultaneously, for the sum of these two gain functions is nothing but the long position gain function. Thus the speculator can acquire an owner's interest in the price movements of a stock without taking title to the stock. Similarly the short position can be taken by buying a put and writing a call. But while the long and short positions are not really basic, in our sense, we shall consider them as such. The case with which stock can be bought and sold, the vast number of such transactions, and the qualitative distinction between the usual long position as opposed to the synthetic one (the stockholders rights and privileges are what I have in mind here) all comprise reasons for considering these "basic."

11 I am indebted to Professor Samuelson for suggesting this use of vectors.
in the transaction. The effect of taking two positions can be seen by adding the two appropriate vectors. Thus, buying a put and also a call yields a straddle: \[
\begin{bmatrix} 1 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.
\]
The vector for the writing of a straddle would be \[
\begin{bmatrix} -1 \\ -1 \end{bmatrix},
\]
and for the writing of two straddles, \[
\begin{bmatrix} -2 \\ -2 \end{bmatrix}.
\]

Vectors can be used to advantage in quickly verifying the conversion principles long since established by option traders: 12

1. Buying a call and selling the stock is equivalent to buying a put,
\[
\begin{bmatrix} 1 \\ 0 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}.
\]
2. Buying a put and buying the stock is equivalent to buying a call,
\[
\begin{bmatrix} 0 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}.
\]
3. Buying a call and selling one half the stock is equivalent to
buying a straddle on half the quantity, \[
\begin{bmatrix} 2 \\ 0 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.
\]
4. Buying a put and buying half the stock is equivalent to buying a straddle on half the quantity, \[
\begin{bmatrix} 0 \\ 2 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.
\]
5. Buying a straddle and buying the stock is equivalent to buying a call on twice the quantity, \[
\begin{bmatrix} 1 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \end{bmatrix}.
\]
6. Buying a straddle and selling the stock is equivalent to buying a put on twice the quantity, \[
\begin{bmatrix} 1 \\ 1 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}.
\]

These same principles from the writer's side are just the reverse of the above rules in the sense that the algebraic sign of each number in each vector must be reversed. Thus:

7. Writing a call and buying the stock is equivalent to writing a put,
\[
\begin{bmatrix} -1 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ -1 \end{bmatrix}.
\]

8. Writing a put and selling the stock is the equivalent of writing
a call, \[ \begin{bmatrix} 0 \\ -1 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \end{bmatrix}. \]

9. Writing a call and buying one half the stock is equivalent to
writing a straddle on one half the quantity, \[ \begin{bmatrix} -2 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}. \]

10. Writing a put and selling one half the stock is equivalent to
writing a straddle on one half the quantity, \[ \begin{bmatrix} 0 \\ -2 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}. \]

11. Writing a straddle and selling the stock is equivalent to writing
a call on twice the quantity, \[ \begin{bmatrix} -1 \\ -1 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} -2 \\ 0 \end{bmatrix}. \]

12. Writing a straddle and buying the stock is equivalent to writing a
put on twice the quantity, \[ \begin{bmatrix} -1 \\ -1 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}. \]

One matter must be kept in mind concerning option conversion.

The option price of the original option determines the option price
of any synthetic option based upon it. This is true regardless of
the prices at which sales or purchases of stock are made. For example,
if a call written at a price of $45 per share is held, and, upon the
market price having advanced to $50, the stock is sold short, the
result is a synthetic put written at $45, not at $50. When these
prices so differ, profits or losses are being taken by the converter.

In the example just given a profit of $5 per share was taken in con-
version. This profit does not, of course, affect the possible profit
outcomes from future price movements; they depend solely upon the new
market position, which in this case is the synthetic put at $45.\textsuperscript{13}

\textsuperscript{13} All of this can be easily seen by observing the gain functions, as
in Figure 7. The result of taking profits and losses in conversion
is to shift the resultant gain function by the amount of profit or
loss.
Figure VII. Call Plus Short Sale at Higher than Option Price
The use of vectors is still appropriate when the transactions in stock are made at prices other than the option price, for the vectors will correctly give the new market position. But just as the cost of assuming a position does not affect the possible future profits that may be derived from it, neither do the profits or losses that may have been taken in converting affect future profits.

Vectors can also be used when considering price-differential options. Such options differ from the usual ones in that they start the holder off with either a paper profit or loss. These paper profits or losses are similar to the profits and losses which arise in conversions: they affect the total amount of profit to be made from a paper, but they do not, at any given time, affect the future profits which may arise from future price movements.¹⁴

So the option has a unique gain function; it is a many-dimensioned thing, and it is also a convertible commodity. These characteristics make it a fitting subject for the activities of investors, speculators, brokers, and dealers.

¹⁴A second matter might also seem of significance: any option position must be a time-limited one (perpetual options are not dealt in), while the usual long and short positions are not limited by time. Thus it might seem that positions of different time dimensions are being combined. This is no real problem, however, as, if need be, expiring options can always be replaced by new ones of the same dimension.
CHAPTER II

THE HISTORY OF OPTION TRADING

Early Option Dealing

The use of options in present day commercial activity is widespread. The history of the use of options is a long one. The earliest recorded time-transaction which seems to have been in nature an option was the one from Biblical times in which Jacob took an option on his wife-to-be, Rachel.¹ Nor was Jacob the last owner of an option who received something less than complete fulfillment upon his attempting the exercise thereof. A somewhat later, but still early, option transaction was described by Aristotle in his Politics.² Thales, a Milesian philosopher, in attempting to prove that the poverty traditionally associated with the members of his profession (even at that time!) was of their choice and not of necessity, foresaw a "great harvest" of olives in the coming season. Through modest payments to the owners of olive presses he was able to obtain option on the use of each of them in Chio and Miletus for the next harvest time. The abundant harvest arrived, Thales let the presses at high rates, and made a good deal of money. The fact that Aristotle

¹Genesis 29: 15-30. For the Jacob-Rachel-Laban agreement to be considered an option, it must be assumed that Jacob had the privilege of leaving the employ of Laban prior to the end of the seven-year period and thus of forfeiting his claim to the "beautiful and well-favoured" Rachel.

refers to this financial device as one "which involves a principle of universal application" may indicate that the use of options was common in his day.

The use of options in commodity or security trading does not seem to have appeared until much later. While in the days of the Roman Empire dealings in securities were relatively well developed, there is no definite evidence available of option-like trading, although time dealings of some kind may well have existed. Well-developed future dealings, of which options were one kind, appeared in Holland in the early seventeenth century, and their modern usage stems from this time. At that period time-transactions took place in the products of whale fisheries. From the brief remarks of Emery, who refers to the transactions, it appears that the dealings may have been in options. There being great uncertainty in the industry as to catches, the consequent fluctuations in price led dealers to sell the products of any particular voyage long before its results became known. It would seem to be natural that these sales would be optional; not in the sense of the dealers having the privilege of exercising depending upon market price, but optional depending upon whether or not

---

3 It is conceivable that the principle he was referring to was that one who corners a market can sell at a higher price than the competitive price.

4 Thales was but the first of many to use options in this manner.


6 Ibid.
any whales were captured.

Direct antecedents of puts and calls as we know them almost certainly existed during the celebrated tulip mania in Holland in the period 1634-37. I have found no specific references to trading in these options, although apparently such do exist. A present-day option dealer places the earliest recorded transaction at "about 1634" in Holland, but gives no reference. This much can be said about the period: In Amsterdam by the time of the mania active speculation in futures was being carried on in well organized markets in both stocks and commodities. The speculation in tulips soon led futures trading in them; in fact, when the object of trade became the excrescences, or outgrowths, on the bulbs, immediate delivery became impossible. One kind of transaction which existed then consisted essentially of a regular sale of bulbs plus the sale of a put: dealers in bulbs in selling to the "layman speculator" would guarantee him against loss for an eight-day period. Most likely the guarantee

7Herbert Filer, "Role of Puts and Calls in Securities," The Commercial and Financial Chronicle, Thursday, September 28, 1950, p. 1. Oliver J. Gingold, in an otherwise quite good article ("Stock Market Price Insurance," Barrons, August 29, 1938, p. 7.), says the "first put or call heard of was in 1688 in Holland when they were written in connection with the tulip boom." Inasmuch as his date is 50 years late for the tulip boom, his assertion can be given no weight.

8N.W. Posthumus, "The Tulip Mania in Holland in the Years 1636 and 1637," Journal of Economics and Business History, Volume I, Number 3, p. 435. It is unfortunate that in writing on such a speculative period Posthumus did not feel it necessary to present in detail the speculative devices used at that time.

9Ibid., p. 434.
was verbal, and not a "put" security as such. The amazing speculative mood of the day, the willingness to enter into other kinds of time transactions, the wildly fluctuating tulip prices, and the fact
that option-market tradition places the use of options in this period—
these considerations indicate to me that the period was one which
would be natural for option trading, and that this trading very likely existed.

Dutch option trading continued from this time. In the last two
decades of the seventeenth century a "lively trade in options in the
India Companies" was carried on. In 1737 a new set of rules to
better regulate option trading were formulated, and in 1771 a
treatise was published in which the technique of option trading was
discussed.

Option trading in securities can be traced in England to 1694.
The English were at this time enjoying their first flurry of specula-
tion in securities. Defoe placed the beginning of the craze in
1680, but the amount of speculation did not become sizable until
1688. By 1692 stock-jobbing had become the subject of a satirical

10 As we shall see subsequently, puts have been used by American
operators in this fashion.

11 Herbert I. Bloom, The Economic Activities of the Jews of Amsterdam
in the Seventeenth and Eighteenth Centuries, (Williamsport, Pa., 1937)
p. 185.
12 Ibid., p. 188 and p. 192.
13 Andrew McFarland Davis, A Search for the Beginnings of Stock
Speculation (Cambridge, Mass., 1906), p. 34.
14 Lord Macaulay, History of England from the Accesion of James the
(footnote continued on next page)
play and a bill had been introduced in the House of Commons for the purpose of "preventing frauds and abuses in buying and selling of parts and shares in joint-stocks." In 1694 a John Houghton, writing in his "serial," described the "manner of managing the trade" and "the manners of refuse":

The manner of managing the trade is this: the monied man goes among the brokers (which are chiefly upon the Exchange and at Jonathan's Coffee House, sometimes at Garraway's, and at some other Coffee-Houses) and asks how stocks go. And upon such information, bids the broker buy or sell so many shares of such and such stocks if he can, and at such and such prices. Then he tries what he can do among those that have stocks, or power to sell them, and if he can, makes a bargain.

Another time he asks what they will have for refuse of so many shares; that is how many guineas a share he shall give for his liberty to accept or refuse such shares, at such a price, at any time within six months, or other time they shall agree for.

(footnote continued) This is the date of the first use of the term "stock-jobber." See also Bloom, op. cit., p. 186. The era is an interesting one. The times were prosperous, and many citizens accumulated savings which they were reluctant to leave idle. The investment outlets for the savings were limited, however: the demand for the stock of the few publicly-held companies (the principal one being the East India Company) was high and stock prices rose to high levels; land which could be purchased was limited in amount and its price was high; and the war being fought on the Continent (the War of the League of Augsburg, 1689-97) made investment in foreign trade risky. To meet the demand for securities all manner of outrageous joint-stock companies were floated, and their stocks furnished the material for much of the speculation of the day. On this period see Macaulay, op. cit., pp. 120-125, and Davis, op. cit.

15 Davis, op. cit., p. 20 and p. 23.

16 Ibid., p. 22.
Having shown what a "refuse," or a call, is, he proceeds to give a form of the contract, and to demonstrate "the conveniency of giving money for a refuse." He then describes "the manner of putting stock," argues in favor of its conveniences and speaks of the "contract for security." 17

The use of options in trading in London most likely was an import from Amsterdam. Davis believed he had traced speculation in stocks back to its beginnings when he got to the British experiences of the 1690's, but in so doing he commented that "if the date be accepted as that of the probable origin of those dealings, the rapidity with which all the methods of modern times were developed will seem almost incredible." 18 He neglected to study the early Dutch experiences, only making a passing reference to the tulip mania. 19 The fact seems to be that option trading had already been developed in Amsterdam, and that it was introduced in London by those with Dutch experience early in the 1690's. In 1689 William III, statholder in Holland who had married Mary, daughter of James II, king of England, himself became British king. The Dutch and English trade rivalries, which had until this time been bitter, were in large part composed under the common ruler. 20 With the improved relations between the two nations,

17Ibid. That a call should be known as a "refuse" is both interesting and not without logic. They were still known as "refusals" during the South Sea excitement in 1720 (Ibid., p. 11), and Sir John Barnard's Act in 1733 to prevent stock-jobbing forbade "putts or refusals." See Emery, op. cit., p. 194.

18Ibid., p. 34.

19Ibid., p. 13.

intercourse increased with speculators with Amsterdam experience, among others, moving to London. It is through them that the trading most likely was introduced to the English. This explanation of the option activity in the early nineties seems reasonable in light of contemporary affairs, and it eliminates the necessity of ascribing to an "incredibly speedy" rate of development of speculative methods.

Options were introduced to France by John Law, the financial genius who provided the French with the securities upon which they could build their renowned speculative orgy of the period 1716-20. Law in his "Mississippi Scheme" incorporated for the French government their colonial activities and sold the stock to the public. The shares immediately became the subject of widespread speculation, Law being a good promoter. Whereas in the tulip mania dealers in effect sold puts when selling bulbs in order to entice buyers, Law served the same purpose by purchasing calls from the holders of his stock at prices far above what there was any necessity for him to pay. These purchases served two purposes: they stimulated confidence in the issues, and, due to the course the prices took in the wild speculation, Law eventually made much money on them. The writers on Law's System

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22 Some writers have associated the entire speculative era with the accession of William III to the British throne. See Davis, *op. cit.*, p. 34.

23 Davis, *op. cit.*, p. 12 et seq.
indicate that the options themselves were new to the French; Law furnishing the nation with the securities with which to speculate, and thereupon instructed them in the fine points of the art. He himself was familiar with both London and Amsterdam trading techniques.  

These are the beginnings of option trading in the three principle financial centers of the day.  
The use of the option in security trading took hold in these markets. As trading in securities grew, so did option trading, it tending to be more important in the speculative eras. While as we have seen, trading in options originated relatively early in modern times, the development of regular and sustained trading in them and the development of option markets was slow in coming, just as the growth and development of stock trading and exchanges were also slow. It was not until the nineteenth century that option trading became sufficiently sustained so that one could say that a market existed. Little is known of this intervening period; nothing appears to have been written on it. In this obscurity the trade and its customs developed into the present-day markets.

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25 I am not familiar with its inception into German trading, but by 1816 such transactions had attained "considerable volume." (Put and Call Brokers and Dealers Association, Inc., Put Option and Call Option Contracts, Second Edition, p. 1.)

26 Around 1720 the speculative craze over Law's activities spread to London and Amsterdam, and option trading became more active in both these centers. See Davis, op. cit., p. 11, and Emery, op. cit., p. 34.

27 Emery, op. cit., p. 34.
European Option Markets

The last of the nineteenth and the beginning of the twentieth centuries appear to mark the period of preeminence for the London option market. In 1902 a contemporary wrote:

Although very large transactions are from time to time done on the French and German markets in options, London is par excellence the option market of the world. Perhaps the largest individual transactions have been done in Paris, where speculators occasionally deal in amount which are almost unheard of on this side; but there is nowhere the same facility for giving and taking [buying and selling], for operating in long and short options, and for hedging against a favourable put or in the firm stock as that which exists in London. It rarely happens that an option is done in the Paris market for more than one month ahead, and in Berlin too the majority of such dealings are arranged for a similar period. In London two and three months' calls are easily negotiated in active stocks.28

London remained a leading option center up until World War II, sharing its leadership, however, with the Continental markets, particularly Paris.29

Option dealing is recognized by the rules of the London Stock Exchange, and trading is done on the exchange. Just as the method of

29 A.E. Davies, writing in the fourteenth edition of the Encyclopedia Britannica (New York, 1929) Volume XVI, p. 829, states that "option dealing is practised more extensively on the Continent of Europe than in Great Britain or America." Sir Steven Killik, a London Stock Exchange official, in 1933 stated that "options have never been so popular a medium of speculation on the London Exchange as on the Continental bourses, particularly Paris." The Work of the Stock Exchange, Second Edition (London, 1934), p. 544. Compare, however, Oliver Gingold's comment (op. cit., p. 7) that "London is easily the most important option market in the world."
trading in stocks and shares is different from that in New York, so is the method of trading in options somewhat different. The principal difference between the London options and the ones we have previously described is that the London option can only be exercised on a prescribed day, not on or before that day. This

30 Stocks and shares are traded in on the London Stock Exchange for current, or future, settlement dates, which occur approximately once every two weeks. These fortnightly spans are known as account periods. The settlement is composed of four days. The "making-up" or "contango" day is the first; brokers must decide on this day on which transactions they will deliver or accept securities, or on which they will make arrangements for carrying over or borrowing stock until some future settlement. On this day the settling price is fixed by the Exchange, and all accounts are made up and based on this price. The "contango" or "backwardation" rates are also fixed; the contango is the interest rate that must be paid for not accepting delivery of securities, and it is usually positive. When the rate is negative it is known as backwardation and this rate is paid to a person for accepting or demanding delivery of securities. The second and third of the settlement days are the "ticket days" when clearing tickets are passed around so that the original seller of any security can deliver it to the final buyer. The fourth is "pay day" when stocks are actually delivered and paid for, and all differences become payable.

The relations between a broker and his customer are much closer in London than in New York. Indeed this is necessary because of the kind of trading done in London. Since payments for purchases are not made until settlement time (and even then they can be deferred until some future settlement by the contango process), large amounts of trading can be done on credit, with no margins being required. The ability to make many transactions without tying up much money is important for dealings in options, as we shall see.


31 See pp. 1-4 supra.
reduces the risk the option writer assumes, but it does not necessarily reduce the buyer's profitability, for he can make trades in firm stock against his option at any time in the period. The London option buyer does not give his money for the premium until the day the option can be exercised, whereas in New York the money is given at the time the contract is entered into.\textsuperscript{32}

The "put" and the "call" are also known by those names in London, but the "straddle" is there termed the "put-and-call."

Options written at the market price are written at the "right" price; those at other prices are said to be "fancy" options.\textsuperscript{33} More complicated options are dealt in in London. The "call o' more" is the outright purchase of 100 shares of a security with the buyer having the option for a specified period to purchase another 100 shares of the issue at the same price. For this consideration the purchaser buys the shares at a price higher than the going market price.\textsuperscript{34}

\textsuperscript{32}Two other differences can be noted: Where a New York option would be written at the market price, the London option would be written at the market, but exercised at the market price plus the contango charges, or minus backwardation. (More precisely, if the market price is \( p \) and the contango rate is \( r \)--in the appropriate units--the option would be exercised at \( p(1 + r) \).) The second minor difference to be mentioned here is that in New York unless the option contract is actually delivered to the writer's broker it need not be honored; in London, if the option is "in the money," the option "speaks for itself," and it is understood that it will be exercised. See S.A. Nelson, The ABC of Options and Arbitrage (New York, 1904), p. 13.

\textsuperscript{33}Higgins, op. cit., p. 4.

\textsuperscript{34}It is not quite a simple option plus the outright purchase; it is the firm purchase plus a "fancy" option, one written above the market price.
Similarly "put o' mores" can be dealt in. There is also the "call o' twice more" where the purchase of 100 shares carries with it the privilege of buying an additional 200 shares at the same price, the "call o' thrice more," etc. In London options can be purchased for one day, several weeks, or several months. Usually the time period is for a forthcoming account. At the turn of this century the Stock Exchange recognized only those options not longer than two account periods in length, but longer papers were actively traded in. By the 1930's the rule had been changed to options not longer than seven accounts, which, assuming fortnightly accounts, comes to about three months. Perhaps trading in longer options still continues. The longer options have been becoming more popular. At the turn of the century the one, two, and three month papers were becoming popular; in 1933 the three month one was by far the most popular. The price of a call is usually equal to that of a put in London, and the put-and-call costs twice as much.

36 Killik, op. cit., p. 55.
37 Ibid., and Higgins, op. cit., p. 2.
38 Charles Castelli, The Theory of Options in Stocks and Shares, (London, 1877) p. 8, says that "the cost of a 'put-and-call' is nearly double that of the 'call' or 'put' separately; and a 'call' can be bought not only with greater facility after an important rise and when prices are inflated, but the premium becomes relatively cheaper than that of a 'put,' the reverse occurring and the later Option having that advantage after a great fall." Higgins writing in 1902 states that only in "exceptional circumstances" where there is a great scarcity of stock or dearness of money does the price of the put-and-call differ from double the single option. The put price equals the call price because of the possibility of converting one into the other (he never mentions the cost of converting). (Op. cit., pp. 7-9). Killik, writing in 1933, says that the price of the call is always identical with the price of the put, and a put-and-call always costs exactly twice as much as the single option (op. cit., p. 54).
London, as well as Continental, option trading has always had the reputation of being more "scientific" than American trading. While options have been used in London in "rigging" the market or in disguising other market operations, they more usually have been used there to profit by the normal day-by-day fluctuations in price. And in these cases the option buyer does not necessarily look for one-way price movements; his option gives him an anchor and lets him play on the market fluctuations in both directions in safety. In taking advantage of the market movements there is active trading in firm stock against the option, thus converting the option from one form to others. By applying himself diligently in this manner the trader can hope to accumulate profits even though no extended price movement runs in either direction. The flavor of London trading is well expressed in the following passage from Higgins:

Now it frequently happens that a giver, wishing to do an option, is undecided as to the direction which the next few points move will take in the stock under consideration, so he commences operations by giving for the put-and-call of the stock and awaits further developments. This, by the way, frequently turns out to be a judicious mode of procedure, especially when the object of the speculator's attention happens to be one of the American Railroad Stocks, in which fluctuations are generally violent and uncertain. The American market has for many years offered a fair field for the giver and for the taker of option money, both parties to the deal in a three months' option having, as a rule, plenty of excitement for the money! Indeed, it is surprising that so many speculators in American shares should continue to deal in "firm" stock when so much amusement can be procured at the moderate prices generally ruling for American options.

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39 Higgins, op. cit., p. 2.
40 Ibid., pp. 55-57.
41 Ibid., p. 18.
The London brokers have not only provided options for the amusement of English speculators; as we shall see later they were active in supplying them to American investors from the 1890's until the 1930's. This international flow was particularly heavy in the 1920's when the London people stood ready to sell "all sorts of privileges in large quantities at any time." As the demand for options fell off in this country, however, the international movement of paper dwindled. Option dealings have not been allowed on the London Stock Exchange since World War II, "apparently because both the authorities and the Council of the Stock Exchange are afraid that outside critics would regard these sensible hedging devices as an undesirable form of speculation." As option trading is beginning to reappear in London's commodity markets, there is an increasing pressure for it to be restored on the Stock Exchange.

Options are recognized by the Paris Stock Exchange; they are traded in on the floor of the exchange, and their prices are quoted on the exchange blackboards. The Syndical Chamber of the exchange

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12 The brokers themselves are by no means the source of all London options. Although none of the writers who have discussed the option market discuss the identity of writers or buyers, it is clear from reading Castelli, Higgins and Killik that many of the speculators who buy options also write them.

13 Gingold, op. cit., p. 7.


15 See the letter to the editor, Investor's Chronicle, March 17, 1956, p. 603.

16 Twentieth Century Fund, op. cit., p. 532, and Gingold, op. cit.
has the authority to control the conditions of option trading and may change these at any time according to the needs of the market.\textsuperscript{47} Options cannot be extended beyond a period of two and one-half months; most are written for thirty days or less.\textsuperscript{48} While the papers are written to be exercised at a given future settlement, they can be, in fact, exercised before the settlement date through a "discounting" privilege which is available in all future transactions.\textsuperscript{49} The French deal predominantly in calls, selling firm stock against them when a put is desired.\textsuperscript{50}

Options are traded in on the Amsterdam Stock Exchange, as in the other European markets. The options cover any length of time up to three months and can be purchased on as few as twenty shares. Unlike the other European papers, the Amsterdam ones can be exercised on or before the date specified in the contract.\textsuperscript{51} In this respect the American option is similar to the Dutch. Before the Second World War, option trading was conducted on the Berlin Stock Exchange.\textsuperscript{52}

\textsuperscript{48}Gingold, \textit{op. cit.}, p. 7, and Higgins, \textit{op. cit.}, p. 58.
\textsuperscript{49}Twentieth Century Fund, \textit{ibid.}
\textsuperscript{50}Gingold, \textit{ibid.}
\textsuperscript{51}\textit{Ibid.}
\textsuperscript{52}Twentieth Century Fund, \textit{op. cit.}, p. 545.
Option Trading in the United States

The origination of option trading in stocks in America is obscure. Future trading in the various grain markets began about 1855.\textsuperscript{53} Option trading in these markets existed at about the same time.\textsuperscript{54} By 1865 the Chicago Board of Trade had adopted a resolution discrediting such trading by their members.\textsuperscript{55} As a result of the first court case involving an option in the United States, in this instance a put,\textsuperscript{56} it is known that they were used in trading in gold coin in 1865. At that time the impact on gold prices of the federal government's financing of its Civil War efforts led to speculation in this field.

This use in other speculative markets would suggest that they were not unknown to the stock market. In the 1870's and early 1880's the pace of option trading increased. Writing in 1904, Nelson states that "twenty years ago trading in options in Wall Street was much

\textsuperscript{53}Emery, \textit{op. cit.}, pp. 40-41.

\textsuperscript{54}George Wright Hoffman, \textit{Hedging or Dealing in Grain Futures} (Philadelphia, 1925), p. 20.

\textsuperscript{55}Ibid.

\textsuperscript{56}Bigelow vs. Benedict, 70 N.Y. 202, discussed by Dos Passos, \textit{op. cit.}, pp. 542-3. The actual instrument used was as follows:

\begin{quote}
Know all men by these presents, that I, C.B. Benedict, for and in consideration of the sum of $250, do agree to receive from M.C. Bigelow, at any time within six months from date he may choose to deliver same, $2500 in gold coin of the United States, for which I agree to pay to the said B. 95 per cent premium on the dollar, or at the rate of $195 in good current funds for each and every $100 of coin. The said B. does not contract to deliver the coin, but pays the $250 for the privilege of delivering or not, at his option.
\end{quote}

Except for the details of the wording, today's puts are in essence the same.
more common than it is to-day." 57 Emery, writing eight years earlier, remarked that "in the last few years, however, privileges have been less common than they formerly were." 58 A straddle written in 1875 became the subject of a second leading court case, this time the subject of the paper was Western Union stock. 59 (The railroads, however, were the principal subject of stock speculation at the time.) Several of the financial and speculative leaders of the nineteenth century have been reputed to be users of options, and it is in this period that most of them were active. The outstanding figure in option trading at this time was Russell Sage, 60 who centered his option activities on the writing side. There was a marked contrast between the kind of option writing in which Sage partook

59 Story vs. Salomon (71 N.Y. 420), discussed by Dos Passos, op. cit., p. 605. The contract read:

New York, May 15, 1875

For value received the bearer may call on the undersigned for one hundred shares of the capital stock of the Western Union Telegraph Company at seventy-seven and one half per cent any time in thirty days from date.

Or the bearer may, at his option, deliver the same to the undersigned at seventy-seven and one half per cent at any time within the period named, one day's notice required.

All dividends or extra dividends declared during the time are to go with the stock in either case, and this instrument is to be surrendered upon the stock being either called or delivered.

(Signed) S.N.S.

The form of the contract is interesting. Its last clause gives it the one characteristic by which it differs from the modern straddle.

60 Nelson, op. cit., pp. 28-29, and Gingold, op. cit.
and the kind in which the London speculators were partaking at the same time. In London the writers were writing insurance on the normal price fluctuations of the market. Sage wrote options on securities in which he was an "insider" and where he had superior knowledge upon which to rely. Furthermore as a leading speculator and market operator in a free-wheeling era, his activities could, and undoubtedly did, influence the prices of the stocks against which he was writing.

Sage is reputedly the writer of one of the largest options in the history of Wall Street, a six-month put on 45,000 shares of Western Union.61 Others of the early speculators who used options were Commodore Vanderbilt, Daniel Drew, Jay Gould, John W. (Bet-a-Million) Gates, James R. Keene, and later, around the turn of the century, Joseph Schwab.62 Vanderbilt and Drew were active in the Fifties and Sixties, as was Gould who "lasted" into the Seventies. Those more closely associated with the increased option activity of the 1870's and 80's were Sage, Gates and Keene.63 In 1885 option trading had become important enough so that the New York Stock Exchange banned it on the Exchange floor by the adoption into its Constitution of Section 12 of Article IV, which reads: "No offers to buy or sell privileges to receive or to deliver securities shall be made publicly at the Exchange, under penalty of twenty-five dollars for each offense."64

61Gingold, ibid.
64Information furnished by the Exchange.
The section still is to be found in the constitution.

In this period under discussion options were widely used in the manipulation of stock prices. By this date American speculators and manipulators had mastered all the tricks of this trade, and much of the more widely known operations of the 1920's was merely repetition of this period's activities. A call on a large block of stocks was frequently the base of the operations of a pool pushing an issue. The difference between the price at which the call was written and the price at which the manipulators were able to unload the stock on the public constituted much of the profit in the entire operation. Or occasionally such operators would originally purchase a large block outright as the basis of their operation provided they could also obtain a put on the block from the party who initially was disposing of the stock. The put insured them against large loss. Calls were used to bribe financial writers into assisting the booming of a stock; short-term puts were offered at low prices to the public to inspire confidence in an issue under manipulation.

While the use of options in manipulation was not uncommon, there was also trading done on some scale for the present-day option uses: insurance and speculation. But this market was a very narrow and limited one. In large measure it rested upon the willingness of some of the larger operators, such as Sage, to sell options. As Emery

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66 Recall the guarantees of the Dutch tulip mania, p. 16, supra.
noted, "the public buy, but seldom sell, privileges, and if the men who are accustomed to dealing in that way stop selling, the field for such practices becomes very circumscribed." There was no steady source of papers written on small lots coming into the market, and the lack of writers who would supply options in this manner was an important limitation on the option market. The stock market in these times was one of widely fluctuating prices; writing insurance against such fluctuations can be expensive, and this no doubt contributed to the paucity of option writers. In this kind of a market there would appear to be many superior ways (such as buying options) of "making a million," the alleged goal of all traders in the period, than by writing options. A further factor limiting option trading was the stamp duty on security trading levied during the Spanish-American War, which cut into trading profits.

With the supply of domestic options thus limited, the London option dealers began in the 1890's to tap the American market by supplying London-type options to American speculators. Nelson cites the case of an American speculator who profited handsomely on the market

68 Nelson, op. cit., p. 23, and Dos Passos, op. cit., Volume II, p. 1349. The tax was levied on calls, but not on puts, calls being "agreements to sell." Similarly the present transfer taxes are levied on calls but not on puts. Presumably the original U.S. Supreme Court decision (Trent vs. White, 181 U.S. 264) is the basis for this.
rise following the second election of McKinley to the Presidency (1900) by buying calls in London prior to the election.\textsuperscript{70} Also, during "the great rise that culminated in 1903, immense profits were paid by London dealers to their fortunate New York customers."\textsuperscript{71} These papers were the London-type;\textsuperscript{72} they were written for forthcoming accounts in London, and trading in them was subject to the rules of the London Stock Exchange. So at the turn of this century the United States option market was small, and consisted of trade with London as well as the purely domestic trade in the American-type option.

Still another factor must be mentioned which tended to limit the activity in option trading. Moral and legal obstacles existed. As the exploits and activities of the better-known speculators became known, and as more laymen dabbled in speculation which resulted in painful losses to them, the operations used in trading became subject to considerable criticism. In a day when margin trading, short selling, and futures trading were considered by many to be immoral and

\textsuperscript{70}Ibid., p. 44.

\textsuperscript{71}Ibid.

\textsuperscript{72}At that time the "American-type" option was principally distinct from the "London-type" because it could be exercised on or before the specified date. But also the American options were then usually written away from the market price, and for relatively short periods, most being written for thirty or fewer days.
undesirable gambling, it must be expected that options particularly would be attacked.

Moral attacks on options have not been unknown in England. In 1906 a volume appeared bearing the title, *International, Commercial and Financial Gambling in "Options" and "Futures": The Economic Ruin of the World.* And in the nineteenth century an English judge commented in a decision concerning an option that "for some reason which he did not understand it had been held that such transaction did not amount to gambling." In 1895 the London *Speaker* in its financial column made the general statement that "dealing in options—that is, in stocks (of commodities) which may or may not be held by the nominal seller—is clearly ethically wrong." But Americans seem to have a comparative advantage over the British in becoming concerned about the morality of such things as speculation. An eminent economist wrote in 1884:

> These means of communication have greatly facilitated bona fide transactions; but, with this growth, gambling transactions have grown up about them to such an extent as often to hide the bona fide transactions from view. —The first step in this direction has been the habit of dealing upon margins; ...In the next stage of speculation, by "puts," "call," and "spreads," even these forms are cast aside. ...They are thus, even in form, simply wagers on the price movement.

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73 By Charles William Smith (London). The book is remarkable in that in carrying on for 339 pages the authors shows no evidence that he knows what options are!

74 Quoted in Emery, *op. cit.*, p. 96 n.

75 Cited in Dos Passos, *op. cit.*, p. 603 f.

A less eminent economist, but a more colorful writer, also treated the subject in the same *Cyclopaedia*:

"Shorts," "buys," "puts," "calls," "straddles," "spreads," "options," "privileges," and the like, are not indicative of commerce, but of speculation pure and simple. ...The moral effect of dealing in products on paper is always debasing; for such dealings lead to idleness, and the road from idleness to vice is an air-line with a single steel-laid track. ...The conclusion, then, is forced upon us, that trading in products on paper amounts to gambling, more or less refined, and is as far removed from legitimate commerce as the equator from either pole. 77

At about the same time the Illinois Supreme Court, in a performance which would seem to belie the augustness usually associated with such bodies, stated:

We are clearly of the opinion that dealing in "futures" or "options," as they are commonly called, to be settled according to the fluctuations of the market, is void by the common law, for among other reasons, it is contrary to public policy. It is not only contrary to public policy, but it is a crime—a crime against the State, a crime against the general welfare and happiness of the people, a crime against religion and morality, and a crime against all legitimate trade and business. This species of gambling has become emphatically and pre-eminently the national sin. In its proportions and

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77 T.T. Bryce, "Products on Paper," Volume III, pp. 374-5. Bryce, in probably the best example of the misuse of mathematics in economics, goes on to "prove" that speculation injures labor (p. 375): "All production is the result of labor, capital, and some natural agent. Consumption is the same, for nothing can be consumed unless something equal can be produced. Denying this, we must deny the indestructibility of matter. The equation of exchange, then, is P (or production) = C (consumption): now, if we add or subtract products on paper from either side of the equation, we get P + S = C, or C + S = P, either of which is absurd; for two things equal to one another cannot remain equal to one another when either be increased or diminished, while the other remains unchanged. Reducing the one and increasing the other makes the equation of exchange still more absurd. Unless it be claimed that production can exist without consumption, or consumption without production, it follows, mathematically, that speculation must injure labor." Oh, the pitfalls of mathematical economics!
extent it is immeasurable. In its pernicious and ruinous consequences it is simply appalling. Clothed with respectability and entrenched behind wealth and power, it submits to no restraint, and defies alike the laws of God and man. With despotic power it levies tribute upon all trades and professions. Its votaries and patrons are recruited from every class of society. Through its instrumentality the laws of supply and demand have been reversed, and the market is ruled by the amount of money its manipulators can bring to bear upon it. These considerations imperatively demand at the hands of the Courts of the country the faithful and rigid enforcement of the laws which have been ordained for the suppression of this gigantic evil and blighting curse.78

And on April 15, 1903, the Chicago Daily News in an editorial on the attempts to change the "anti-option" bill then in effect, stated:

...The difference between a dealer in that sort of gambling chance and a man who buys and sells grain under Board of Trade rules is the difference between a tin horn gambler and a merchant. ...The only effect of abolishing or crippling the law would be to put Board of Trade members on a level with the crap-shooters of the levee. Dealing in "Puts and Calls" is mere cheap gambling on the turn of the market the next day. There is not and cannot be the slightest pretense of buying and selling grain about such a pitiful performance. It is a "business" suitable only for street arabs. Indeed, to permit the practice will promote gambling among office boys and clerks...79

These words, some of which are very strong, undoubtedly sprang from feelings just as intense. What concerns us here is that they existed and were expressed; they affected option trading in securities to some, but to an unknown, extent.

Some of the strong feelings concerning options were reflected in "anti-option" laws. The English had had experience with such laws.

78Quoted in McMath, op. cit., pp. 5-6.
79Quoted in McMath, op. cit., 31-32. The use of options in connection with Board of Trade operations will be discussed below.
In 1733 Sir John Barnard's Act was passed "To prevent the infamous practice of stock jobbing." The act forbade bargains for "putts or refusals," but it did not apply to shares or to foreign stocks, so "putts and refusals" on them were legal. The Act was repealed in 1860, it having had "absolutely no effect in stopping speculation." In addition, common law on option contracts had developed, both in Great Britain and in the United States. Briefly stated, the courts held that options stood on the same footing as other contracts: They were not illegal per se. However, where it appeared that the intention of the parties to the contract was to settle the contract by the payments of "differences," and not to deliver or accept stock (or commodity), the courts held the contracts to be wagers and held them void. Furthermore, the legality of options was reinforced in legal opinion somewhat later (in 1899) when the U.S. Supreme Court ruled the government stamp tax was to be levied on calls. Thus it was against this background of common law that there were passed a number of "anti-option" laws.

From the expressions against option trading previously quoted, it is doubtless obvious that the relatively small option activity related to stock speculation was not alone responsible for the criticism.

80 Emery, op. cit., p. 194.
81 Dos Passos, op. cit., p. 603.
82 Emery, ibid.
84 See p. 32, supra.
Indeed it is impossible to understand the wave of legislation without considering option activity surrounding the commodity exchanges. Option trading in the formative period of the exchanges has already been mentioned, and so has the 1865 resolution of the Chicago Board of Trade discrediting it.\(^85\) Despite the resolution the trading continued, not on the regular trading floor, but on the premises, in members' offices and adjacent rooms. Members as well as employees of the Board were active in it, and outsiders also participated.\(^86\) In 1872 a certain Chandler made extensive use of the option activity in a most interesting attempt to corner the market for June oats. In addition to buying cash oats as they appeared as the floor and oats for June delivery, he also freely sold puts which expired in June to the extent of 3,700,000 bushels of oats. While the amount of grain under option in this case is misleading as to the normal volume of trading, nonetheless it does indicate that puts and calls were commonly dealt in.\(^87\) Such were not the normal uses of options however. Dealers

\(^{85}\) p. 28, supra.

\(^{86}\) See Emery, op. cit., pp. 43-54; McMath, op. cit., pp. 4-5, and Dealings in "Options" and "Futures": Protests, Memorials, and Arguments against Bills Introduced in the 52d. Congress. (Issued by New York Cotton Exchange, New Orleans Cotton Exchange, Board of Trade of the City of Chicago, and New York Produce Exchange, 1892), p. 71, for discussion of this activity.

\(^{87}\) See Dos Passos, op. cit., pp. 609-611. Chandler was able to sell puts in this volume because the other speculators active in the Board soon recognized the attempted corner and they had confidence in being able through concentrated activity to quash it. They bought the puts to profit further from their activities. Through mass selling they beat down the price of June oats, insuring the profitability of their option holdings. But to no avail: Chandler refused to honor the puts, he died soon thereafter, and the court ruled that his estate need not make payment; the whole affair being against public policy, the contracts were void.
and brokers used them as insurance against market position, to some extent, but by far the larger part of them were used to assume speculative positions. And these positions were, for the most part, of very short duration. The option trading usually commenced after the day's closing of the regular trading, and many of the options were for one day or "over-night"—good until the next day's regular trading established new grain prices. Papers up to a week in length were common, and occasionally there were longer ones. In these speculative transactions, delivery was seldom demanded on a profitable option, the holder instead accepting payment of the difference between the market and contract price. Thus there was an active trade carried on which, had it been brought to a court test, would have been declared illegal by common law. Such trading was not unique to the Chicago market. Other commodity markets were also experiencing the same activity. In 1887 the New York Produce Exchange adopted a rule which prohibited its members to "buy or sell... 'puts and calls,' or...deliver, receive, or margin any contracts based upon such privileges," but little attempt was made to enforce the rule.

88 For it to be so declared, of course, one of the parties to a contract would have had to bring the matter to court. This was seldom done, there being honor among speculators, if not among thieves. Indeed, one of the principal objections expressed against the anti-option laws we shall shortly discuss was that it permitted dishonest speculators to "Welsh" on contracts which were entered into in good faith.

89 Emery, op. cit., p. 53, 54.
It was primarily against the option (although futures transactions were also often included) activity on commodity exchanges that the so-called "anti-option" laws were directed. Pressures for the adoptions of such laws came for two kinds of reasons. The first was that many amateurs and laymen began dabbling in options, and at times they suffered heavy losses which they could ill-afford. And in the farm elements there was a widespread belief that through option and futures trading prices for commodities were suppressed by speculators to below their "natural" levels - this to the benefit of the speculator's purse and at the expense of the farmer's.

That those responsible for the pressures toward passing the legislation and for framing and interpreting the legislation did not understand options and futures trading and the economic effects of such speculation is evident. A member of the General Assembly of the State of Illinois said that "he would not know a 'put' or a 'call' if he saw one coming down the aisle." 90 A court decision in Missouri declared concerning a put that "there could be no intention to deliver, when there is an option of this sort." 91 The following passage appeared in a journal in 1896:

It is not so many years ago since a large and representative meeting of Western American farmers passed a resolution against options on the score that they tended to unfairly reduce the price of wheat, and it was just three weeks after that meeting that a convention of the

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90 McMath, op. cit., p. 44.
91 Dos Passos, op. cit., p. 614 f.
National Association of American Millers, attended by some 500 members, was held in Minneapolis, and passed a resolution condemning options, on the ground that they unfairly raised the price of wheat.92

And in hearings before a Congressional committee a witness asserted that trading in puts tends to lower market prices because the buyer of a put has more incentive to lower prices than the seller has to raise them!93 This lack of understanding is important, for people often find it easier to condemn something they don't fully understand.

The first of the "anti-option" laws were passed in Illinois in 1874. The statute, which constituted Section 130, Chapter 38 of the Criminal Code, read:

Whoever contracts to have or give himself or another the option to sell or buy at a future time any grain or other commodity, stock of any railroad or other company, or gold, or forestalls the market, or attempts to do so in relation to any of such commodities, shall be fined not less than $10 nor more than $1,000, or confined in the county jail not exceeding one year, or both; and all contracts made in violation of this section shall be considered gambling contracts and shall be void.94

The Illinois courts in interpreting the law initially ruled that all options were made void by the statute.95 A later court, however, ruled that only those options which were in nature gambling transactions, i.e., those intended to be settled by differences, were void.96

92Bradstreet's, August 22, p. 542, quoted in Emery, op. cit., p. 118.
93Dealings in "Options" and "Futures," ibid., pp. 206-207.
96Stewart Case (282 Ill. 192, 196), discussed by McMATH, ibid., p. 26.
The new decision consisted of a return to the common law ruling. This return was formalized by amending Section 130 in 1913 by the insertion of the words, "where it is at the time of making such contract intended by both parties thereto that the option, whenever exercised, or the contract resulting therefrom, shall be settled, not by the receipt or delivery of such property, but by the payment only of differences in prices thereof," into the statute.  

The Illinois statute was but one of many state laws. Ohio in 1882, passed a law almost identical to the Illinois one, save that the act specified that it applied only to those contracts where there was no intent to deliver or accept delivery, but to settle by differences. All future transactions where there was no intent to deliver were prohibited in several states. Among them were Georgia, Mississippi (in 1882), Tennessee (1883), Arkansas (1883), Texas (1885), South Carolina (1883), Michigan (1883), Iowa (1886), and Missouri (1899). All these states have important agricultural interests, and it is the dealings in commodities that were primarily objectionable to the legislators. They were all passed (with the possible exception of the Missouri law) in the period of falling agricultural prices, emphasizing the importance of the belief that farm prices were depressed because of the volume of "fictitious" selling by speculators.

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97McMath, op. cit., p. 60.

98See Emery, op. cit., pp. 195-199, for a discussion of the state laws of this period.

Because of wild speculation in securities just prior to the adoption of the present constitution of the State of California, Section 26 of Article IV reads: "All contracts for the sale of shares of the capital stock of any corporation or association on margin, or to be delivered at a future day, shall be void, and any money paid on such contract may be recovered..." 100 The various state laws (California's Constitution excepted) although directed against the commodity markets, often included the security markets in their regulations. They did not noticeably reduce speculation in commodities. In Illinois, despite the law and court interpretations, option trading continued on the premises of the Board of Trade. The President of the Board testified before a Congressional Committee that the Board had several times applied to state authorities asking them to enforce the law, but to no avail. 101 Those wishing more effective regulation turned to Congress, and in the last decade of the nineteenth century several anti-option bills were introduced there. 102 The first of these, the "Butterworth" Bill, after an Ohio representative, was introduced in 1890 in the House of Representatives, but it never came to a vote. In 1892 the "Hatch" Bill, after a Missouri Representative, was introduced and it very nearly became law. It was entitled, "A Bill defining 'options' and 'futures,' imposing special taxes on dealers

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100 Emery, Ibid., p. 177.
101 Dealings in Options..., p. 71.
102 See Emery, op. cit., pp. 219-223, on the attempted Congressional legislation, and also Emery, "Legislation Against Futures," Political Science Quarterly, March, 1895.
therein, and requiring such dealers and persons engaged in selling certain products to obtain licenses, and for other purposes." It did not prohibit options and futures, but levied prohibitive taxes on such dealings. Only options on commodities were subjected to taxation, not those on securities. The Bill passed the House, passed the Senate with a few amendments added and was returned to the House for further consideration of the amendments, which were minor. But Congress expired before it could be re-voted on in its final form. In 1894 a similar bill was introduced by Hatch again; once again it was passed in the House, but it never came to a vote in the Senate. We have never had a federal anti-option law.

The organized exchanges intensely opposed the proposed legislation, of course, for its passage would have eliminated much of their business. It is interesting to note the manner of their opposition. Because at best, option trading was a peripheral activity with them; it was expendable; the futures trading was the heart of the business of the exchanges. As a result the exchange officials invariably denounced option trading, while pointing out the importance and necessity of futures trading.103

103 See Dealings in Options..., The Chicago Board of Trade referred to options as "gambling contracts" (p. 43), and its president testified, "It is a pure bet that the market will be lower the next day or will be higher the next day...It is a sort of gambling which is generally demoralizing." (p. 71). The New Orleans Cotton Exchange states that puts and calls were "nothing more or less than wagers" (p. 21). The New York Produce Exchange acknowledged options "as a species of gambling called 'puts and calls' or 'privileges,' which are transactions opposed to law and good morals, and should not be permitted under any circumstances." (p. 62). The tenor of these comments is, I think, to (footnote continued on next page)
Board of Trade attempted during the hearings and debate on the anti-
option bills to put pressure on the brokerage houses to cease
dealings in options "for the duration," because of the adverse
affect the options were thought to have on the chances for defeating
the bills, but apparently these attempts failed.\footnote{104}

This rather lengthy discussion of the mood and legislation of
the latter years of the nineteenth century and the first ones of the
twentieth is included in an attempt to portray the extent of an
intangible factor tending to limit option trading in securities.
Inasmuch as this trading was concentrated in New York, where no
anti-option law existed, the legislative acts did not have much
direct affect on activities. But the fact that they existed may
have reinforced the feelings of many that there was something immoral
in option trading and in this manner have had an indirect affect on
such trading. Indeed, these same feeling are not absent today, and
they are still of importance in studying the put-and-call market.

(footnote continued) be explained by two considerations: first, that
options were used on the produce exchanges primarily as cheap specu-
lations and then were settled by differences, and second, that by
denouncing options, the trading in which the option was expendable
to them, they could hope to appease the forces pressing for passage
of the bills. They could thus concentrate on the defense of futures
trading, their life blood.

\footnote{104}\textit{Ibid.}, p. 289. We will not trace subsequent trading in options on
commodity exchanges. Such trading did exist in the 1920's and into
the 1930's. See G. Wright Hoffman, \textit{Future Trading Upon Organized}
Option trading was banned on commodity exchanges by the Commodity
Exchange Act, passed in 1936.
Thus there were many factors which tended to limit the scope of option activity in the period extending into the twentieth century. The nineteen-twenties, however, brought renewed interest in option trading; in fact, in the frenzied speculation of the later boom years this trading reached a peak which has not to this day been surpassed.

Again, the uses of options were many. An important one, even though it accounted for relatively few of the papers written, was manipulation. The manner of use was the same as in the early years.\footnote{105} Calls were used as the basis of the operations of a pool booming a stock, or puts may have been given them to safeguard extensive positions the pool had assumed. The widespread use of options in manipulation led one writer to state that "The option is the invariable prerequisite to a market operation of this sort."\footnote{106} Data presented in the Twentieth Century Fund study indicate 49 option pools between 1920 and 1933, with twenty occurring in 1929 and ten in 1930.\footnote{107}

But many more options were used for speculative and insurance uses. The wildly fluctuating stock-market prices created a strong demand for puts and calls. One new use for puts developed: to satisfy brokers' margin requirements.\footnote{108} The usual margin or

\footnote{105}See pp. 30-31, supra. Also see Twentieth Century Fund, \textit{op. cit.}, pp. 473-4, for an example of the use of calls in "touting" an issue by a pool of operators. Also Gingold, \textit{op. cit.}, p. 7.


\footnote{107}\textit{Op. cit.}, pp. 451-2. These are options on 10,000 or more shares of stock held completely or in part by Exchange member firms.

\footnote{108}I am indebted to Mr. Victor Cook of Merrill, Lynch, Pierce, Fenner, and Beane, for pointing out to me this use. S.S. Huebner, \textit{The Stock Market}, (New York, 1922), p. 76 also cites it.
deposit required by a broker for the purchase of stock was about
twenty per cent; thus a purchase of 100 shares of a $60 stock would
require $1200 in cash. The speculator could buy stock with a
nominal cash payment of, say, $200, provided that he also purchased
a 30-day put on the stock and deposit it with his broker. The cost
to the speculator of the put would have been $137.50, and it would
have been written at a price of $57 or $58. Thus for $337.50
stock could be purchased, and the broker would be completely pro-
tected against loss for 30 days. By the end of the 30 days the
speculator could have sold the stock for profit, or, if the price
had gone against him, he could have purchased another put and had
another go at it, should he choose to.

As has previously been indicated, London was once again an
important source in meeting the large demand for options. Gingold
states that in these busy markets, "London option dealers thought
nothing of supplying overnight calls on 100,000 shares of a single
stock to American operators." 109 But there was also a sizable in-
crease in the domestic supply. The same writer states that, "Some
Stock Exchange firms, prior to 1930, wrote as many as 50,000 to
100,000 shares daily in options, and at least 100 outside brokers
were interested in this business alone." 110 An unpublished SEC
report on the option market reports writing an extensive scale by
both individuals and investment trusts in the Twenties. 111 This

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110 Ibid., p. 7.
(February, 1944), p. 15.
pace of activity contrasts with the present one when in a good week
the volume will reach 150,000 shares and when less than twenty-five
brokers do this business.

While the volume of activity in options was higher than it is
today, the option market was considerably less orderly. Much of
the business did not go through the option dealers - the Stock
Exchange houses who were writing options presumably supplied their
own customers - and the classification "option dealer" included
many persons who conducted their business on the street corner and
who kept their books "in their hats."\textsuperscript{112} Defaults on option con-
tracts were not uncommon.

The 30-day option was the most popular one in the Twenties, and
its fixed price was $137.50, the "points away from the market" being
varied. Shorter options were also traded in at fixed prices;
seven day papers cost $62.50 and fifteen day ones $87.50. The trend
to the longer options written at the market has been a recent one.

While the congressional investigations of the securities in-
dustry did not ignore the option market, their primary attention
was focused on the larger elements in the industry and not on the
peripheral activities. Mr. Pecora, in the "Pecora Investigations,"
spent little time on puts and calls, but it is evident from the few
questions he put to witnesses on the topic that he regarded these

\textsuperscript{112} Oliver Gingold, "Option Trading Acquires New Vigor," \textit{Barron's},
May 22, 1944, p. 20.
contracts as gambling devices. The original framers of the Security Exchange Act of 1934 would have prohibited options outright "on the premise that it was impossible to distinguish between the good and the bad." After testimony by put-and-call industry people, Congress substituted for the prohibition a rule-making power on the part of the Security and Exchange Commission. Thus the reaction to the activities in the Nineteen-Twenties of the security industry nearly resulted in elimination by legislation of the put-and-call market. The "modern" option market dates from these early Nineteen-Thirties.

114 Loss, op. cit.; see also Filer, op. cit., p. 2 of reprint.
CHAPTER III
THE SIZE OF THE OPTION MARKET

This chapter concerns the dimensions of the put-and-call market: its size as measured by volume, the breadth of its activity, and the thickness or thinness in option dealings. While no one of these dimensions alone can adequately describe the size of the market, a consideration of all of them taken together can do the job much better.

The volume of trading in puts and calls in recent years has been increasing, as can be seen in the data presented in Table I.¹

¹The volume of trading in the option market that is used in this study is the number of shares of stock covered by the options sold in the particular period in question through the members of the Put and Call Brokers and Dealers Association. (Very few options are sold by non-members of the Association.) This measure is not entirely adequate, however, for it neglects the varying time dimensions of the option contracts. An alternative measure of the volume would be the number of share-days involved in the contracts sold in the period in question. The significance of the difference can be illustrated by considering two different time periods; in the first ten ninety-day calls are sold, and in the second ten six-month calls are sold (all options covering 100 shares). Using the number of shares under option as a measure of volume would suggest the periods were equal. Using the number of share-days under option as a measure would suggest the second period was twice as large as the first. While which is the better method will in most instances depend upon the use to which the measures are being put, for many problems which come to mind it would appear that the share-day method would be superior. SEC data, however, are totaled in terms of the number of shares under option, and so we use them. Only a very rough approximation of share-day volume could be made from the data the SEC receives from the Put-and-Call Association.

It will be well to point out in advance that the increase in share-day volume due to the increasing popularity of the longer-term option is not reflected in the volume figures being used in this chapter.
Roughly speaking, option activity fluctuated around a constant level from 1938 until 1950, when the volume jumped to 2,631,200 shares, almost double the preceding year's activity. Volume increased significantly again in 1954 when it hit 4,007,300 shares. The increase continued into 1955 when, during the first three-fifths of the year, it was at an annual rate of over 6,100,000 shares.\(^2\)

Of course, during this period the volume of trading in stocks on the exchanges was also increasing, and option volume is closely correlated with exchange volume.\(^3\) Table I also presents the average weekly volume of both option and New York Stock Exchange trading. In the period since 1950 option volume has been higher relative to Exchange volume than in the period prior to, and including, 1950. But the put-and-call market is still very small; in the period under review its annual volume never was as large as one per cent of Exchange volume.

An interesting characteristic of option trading which seems to appear in Table I is that option volume relative to Exchange volume tends to be highest in Presidential election years. In terms of the percentage of figures, 1940, 1944, 1948, and 1952 are all "local peaks." This should not be unexpected. Presidential elections are significant uncertain events whose outcomes, it is firmly believed by most market traders, should affect stock market prices.

\(^2\)The data for 1955 only cover through August 13.

\(^3\)For the eighteen year period for which data are available, the correlation coefficient between option and exchange volume is .87.
### TABLE I

**Option Volume and New York Stock Exchange Volume, 1938-1955**

<table>
<thead>
<tr>
<th>Year</th>
<th>Option Volume&lt;sup&gt;a&lt;/sup&gt; (00)</th>
<th>Option Volume Per Week&lt;sup&gt;a&lt;/sup&gt; (00)</th>
<th>NYSE Volume Per Week&lt;sup&gt;b&lt;/sup&gt; (000)</th>
<th>Option Volume as a Percentage of NYSE Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1938</td>
<td>14,230</td>
<td>274</td>
<td>5,721</td>
<td>.48</td>
</tr>
<tr>
<td>1939</td>
<td>11,419</td>
<td>220</td>
<td>5,039</td>
<td>.43</td>
</tr>
<tr>
<td>1940</td>
<td>12,056</td>
<td>232</td>
<td>3,992</td>
<td>.58</td>
</tr>
<tr>
<td>1941</td>
<td>8,353</td>
<td>161</td>
<td>3,281</td>
<td>.49</td>
</tr>
<tr>
<td>1942</td>
<td>6,854</td>
<td>132</td>
<td>2,415</td>
<td>.55</td>
</tr>
<tr>
<td>1943</td>
<td>13,713</td>
<td>264</td>
<td>5,360</td>
<td>.49</td>
</tr>
<tr>
<td>1944</td>
<td>16,907</td>
<td>325</td>
<td>5,059</td>
<td>.64</td>
</tr>
<tr>
<td>1945</td>
<td>21,076</td>
<td>405</td>
<td>7,261</td>
<td>.56</td>
</tr>
<tr>
<td>1946</td>
<td>16,978</td>
<td>326</td>
<td>6,994</td>
<td>.47</td>
</tr>
<tr>
<td>1947</td>
<td>12,179</td>
<td>234</td>
<td>4,916</td>
<td>.48</td>
</tr>
<tr>
<td>1948</td>
<td>16,637</td>
<td>320</td>
<td>5,812</td>
<td>.55</td>
</tr>
<tr>
<td>1949</td>
<td>13,816</td>
<td>266</td>
<td>5,235</td>
<td>.51</td>
</tr>
<tr>
<td>1950</td>
<td>26,312</td>
<td>505</td>
<td>10,092</td>
<td>.50</td>
</tr>
<tr>
<td>1951</td>
<td>32,791</td>
<td>630</td>
<td>8,529</td>
<td>.74</td>
</tr>
<tr>
<td>1952</td>
<td>31,023</td>
<td>596</td>
<td>6,496</td>
<td>.92</td>
</tr>
<tr>
<td>1953</td>
<td>26,353</td>
<td>507</td>
<td>6,324</td>
<td>.74</td>
</tr>
<tr>
<td>1954&lt;sup&gt;c&lt;/sup&gt;</td>
<td>40,073</td>
<td>771</td>
<td>11,082</td>
<td>.70</td>
</tr>
<tr>
<td>1955&lt;sup&gt;c&lt;/sup&gt;</td>
<td>37,625</td>
<td>1176</td>
<td>13,355</td>
<td>.88</td>
</tr>
</tbody>
</table>

<sup>a</sup>Number of shares under option.

<sup>b</sup>Number of shares of common stock traded.

<sup>c</sup>First 32 weeks

Sources: SEC; NYSE Annual Report, 1955; Barron's.
The safest way to try to profit from the outcome of these events or a way to hedge one's position against the possible unfavorable impact of the outcome is to purchase options.

The relation between option and exchange volume is shown in more detail for the 1952-55 period in Figure 1, where actual weekly data are graphed, along with the Dow-Jones Industrial Stock Price Average. Option volume is seen to follow stock exchange volume rather closely, both in terms of the level of activity and the short-term fluctuations which both of the series display. The one period in which weekly option volume lagged relative to exchange volume was the one from August 29, 1953 to September 4, 1954. This period, which was characterized by increasing exchange volume and steadily climbing market prices, was one in which option volume averaged .61% of exchange volume, while during the rest of the 1952-1955 period the average percentage was .89. It is not clear why this relative dip should have occurred.\footnote{A thought which naturally comes to mind is that the price movement in the market may be a partial explanation. The market rise during the last half of 1949 and the first half of 1950 was similar to the one during which the option dip in question occurred. In both periods the Dow-Jones Industrial Average rose about 38% in a steady, nearly unbroken, manner. Both rises followed periods of slightly falling prices; both periods experienced increases in exchange volume. During the last half of 1949 and the first half of 1950 option volume relative to exchange volume amounted to .475%; during the surrounding half years (first half of 1949 and the last half of 1950) option volume amounted to .535% of exchange volume. There appears to be a relative dip here also, but not nearly of the magnitude of the 1954 one. This hardly proves that the kinds of markets characterized above tend to be associated with relative dips in options trading. And it is difficult to see why this should be the case. Periods of rising prices create paper profits which should increase the demand for options to protect these profits. Also in such times (footnote continued on next page)
Figure I. Weekly Option Volume, New York Stock Exchange Volume, and Dow-Jon Average, * January 1, 1952 - August 12, 1955

*Friday closing average
Volume, New York Stock Exchange Volume, and Dow-Jones Industrial Average, January 1, 1952 - August 12, 1955

- Shares (millions)
- NYSE Vol. (right scale)
- D-J Ind. Ave. (left scale)
- Option Volume (left scale)

1953 1954 1955
Another measure of the size of the option market is the number of issues upon which options are traded. There are over 1500 security issues listed and traded in on the New York Stock Exchange, there are nearly 900 such issues traded in on the American Stock Exchange, and there are thousands of issues traded in on the over-the-counter market. This is the magnitude of the number of securities on which options might be traded; in practice there is no option trading on most of these securities. By far the greater share of option activity is confined to the common stocks listed on the New York Stock Exchange.

During a typical week's trading on the New York Stock Exchange for the first eight months of 1955, there were anywhere from 1100 to 1400 issues traded in. During the same period in the option market

(footnote continued) the leverage to be gained through option trading should augment the demand for calls for speculative purposes. Some considerations which might tend to explain the dip would be that perhaps writers' portfolio strategies failed to respond immediately to the new market trend and that they suffered sufficient losses as a result so as to cause them to have to curtail writing activity. This would reduce the supply of options. Or the very steadiness of the market price rise might not have imparted to speculators sufficient uncertainty about near-term futures prices to bring them to purchase options for insurance use. Or this initial stage of the 1953-1956 price advance might still not have been in this early stage impressive enough to the small investor to lure him into purchases of options for speculative purposes. These are not very convincing arguments, and the explanation of the dip remains unsolved.

An additional factor present in both internals was a low level of Federal Reserve Board margin requirements. The level was at 50% during each period. This low level overlapped both the beginning and end of each of the relative dips, however. The relationship between option trading and these margin requirements will be discussed in a later chapter.
there were 120 to 160 issues written on. As with option volume, the number of option issues generally follows the pace of Exchange activity. The narrowest option market in recent years occurred during the week ending July 24, 1953, where only 51 issues were written on; the broadest occurred during the week ending December 10, 1954, when 180 issues were written on.

The number of option issues during the course of a year would be much larger than 180, of course, since there are many issues which are written on only irregularly. The fact that such relatively obscure issues as Boston Personal Property Trust, National Uranium of Utah, Warren Foundry and Pipe, and West Indies Sugar occasionally turn up among the option issues indicates the number of yearly issues would be considerably greater than 180. A perusal of the put-and-call advertisements appearing in the New York Sunday Times for a six month period plus the number observed from SEC data for a four week period yielded over 330 option issues. One option dealer has estimated that in a year's trading options are written

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5This is for a five trading-day week. For the week ending January 2, 1954, there were only 45 option issues.

6My data stop in mid-August, 1955.

7For the period between June 5 and July 1, 1955, volume data were accumulated on all issues when the amount of that volume was at least 1000 shares in the course of a week's trading. During this period option volume was higher than average, as were the number of option issues traded in. These data will be discussed subsequently.
on between 500 and 600 issues. This does not seem far wrong.

The fact that option volume amounts to less than 1% of Exchange volume and is spread over approximately 1/3 of the number of Exchange issues means that trading in the average individual option issues is relatively less active than in the average individual Exchange issue. In most option issues the weekly volume is very small. This was observed during the four weeks for which volume in individual issues was most closely examined. During the first week, in only 1/2 of 114 issues was the volume of option sales on 1,000 shares of stock or more. There were 3/4 such issues in the second week out of 162 total, 52 out of 176 in the third, and 1/6 out of 159 in the fourth week. In all, in only 115 issues was there at least one week out of the four when option sales reached 1,000 shares in the issue.8

U.S. Steel Common is probably the largest option issue. For the thirteen weeks during which its volume was examined,9 the smallest week was that ending January 21, 1955, when options were

8Of the 115 issues only three were not common stocks. During one week options on 1,200 warrants of the Tricontinental Corp. were sold; during two weeks options on 1,000 shares of Missouri, Kansas, and Texas Preferred Stock were sold; and during one week options on 1,700 shares of Allegheny Corp. Preferred Stock were sold. Both the preferred stocks are speculative issues, as are the warrants, of course. I have also seen options advertised on Missouri Pacific Preferred Stock.

9The SEC gets complete volume data on each issue, but it only gets nominal price quotations for about 1/0 (the number varies from time to time) leading stocks. For a five week period (October 10 - November 11, 1954), and two four week periods (January 2 - January 28, 1955 and June 5 - July 1, 1955) complete price and volume data were accumulated for this study. In addition, for the four week period in June, 1955, volume data was collected in other issues when such volume equalled or exceeded 1,000 shares per week. This latter material was referred to in footnote 7, above.
written on 1200 shares; the largest was that ending November 5, 1954, when options were written on 15,500 shares. The average weekly volume for the thirteen weeks was 6,238 shares. The average weekly volumes for the leading option issues during the four week period more closely examined are among the data presented in Table II. In this period, more active than the usual, all the issues averaged less than 10,000 shares per week, and all but two averaged less than 5,000 shares. These statistics emphasize both the smallness of the option market and its thinness.

Option trading in the stock of many large, well-known companies, whose shares are actively traded on the Stock Exchange, is very small. In a thirteen week period, of 45 such issues, in 31 of them there was at least one week when no option sales were reported. Among the 31 were Republic, Armco and Bethlehem Steels; Cities Service; Standard Oil of New Jersey; Gulf and Phillips Oils; Southern, Northern and Canadian Pacific Railroads; Douglas Aircraft; American and Pan American Airlines; Montgomery Ward; DuPont; etc.

In light of the sporadic activity in securities such as these, it is not surprising that a substantial proportion of option volume occurs in a few issues, usually the market favorites of the time. For the four week period previously mentioned, the seven leading option issues are presented in Table II. The seven issues account for nearly one fourth of all option volume. All seven of the stocks were market favorites at the time with the possible exception of
National Container, the leading option issue. Although they were the largest of the option issues, option trading in all seven amounted to but 1/2% of the Exchange volume in the seven issues.

Because the week by week volume for individual issues tends to be highly uneven and sporadic, for periods of one week option volume tends to be even more concentrated. Table III summarizes this for the same four week period. In the typical week during this period the largest ten issues accounted for about a third of all option sales, and the largest twenty issues for about half of all sales. There are indications that even more concentration occurs in the typical week. Compared with this option

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10 The National Container experience is interesting. Its average weekly volume in 1955 was 33,200. For the four weeks in question the option and Exchange volumes are as follows:

<table>
<thead>
<tr>
<th>Week ending</th>
<th>Options</th>
<th>Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 10</td>
<td>6,800</td>
<td>25,200</td>
</tr>
<tr>
<td>June 17</td>
<td>4,600</td>
<td>25,700</td>
</tr>
<tr>
<td>June 24</td>
<td>16,400</td>
<td>125,600</td>
</tr>
<tr>
<td>July 1</td>
<td>4,300</td>
<td>64,100</td>
</tr>
</tbody>
</table>

Why should an issue like National Container, which is not generally a speculative favorite, suddenly become the leading option issue, and for one week, a leading market issue? A check of Barron's and Moody's Corporate News yielded nothing out of the ordinary which would seem to warrant the activity. The stock is a low-priced one, was selling at that time at around $17, and subsequently went as high as $24 before the Eisenhower heart attack. Those who bought calls probably made money (about twice as many calls as puts were sold on the issue), depending on the premiums paid. Unfortunately, premiums are not available.

11 For the forty-odd stocks for which nominal prices are available the volume data cover for thirteen weeks. During these thirteen weeks the average of the weekly cumulative percentages of total weekly option sales were, for the first, second, and third largest issues: 8.1%, 12.7%, and 16.1%. All of these percentages exceed the similar ones in Table III. So for the thirteen weeks taking all issues could not possibly lower the percentages and, in fact, it would raise them. So probably Table III understates the concentration somewhat.
TABLE II

Leading Option Issues, June 5 - July 1, 1955

<table>
<thead>
<tr>
<th>Issue</th>
<th>Option Volume (Shares)</th>
<th>Average Option Volume per wk.</th>
<th>Cumulative % all O.S.</th>
<th>NYSE Volume</th>
<th>Option Vol. as % of NYSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Container</td>
<td>32,100</td>
<td>8,025</td>
<td>5.9</td>
<td>240,600</td>
<td>13.3</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>28,700</td>
<td>7,175</td>
<td>11.1</td>
<td>726,300</td>
<td>4.0</td>
</tr>
<tr>
<td>Chrysler</td>
<td>14,700</td>
<td>3,675</td>
<td>13.8</td>
<td>318,200</td>
<td>4.6</td>
</tr>
<tr>
<td>Sperry-Rand</td>
<td>14,500</td>
<td>3,525</td>
<td>16.5</td>
<td>868,200</td>
<td>1.7</td>
</tr>
<tr>
<td>Pennsylvania Railroad</td>
<td>14,300</td>
<td>3,575</td>
<td>19.1</td>
<td>546,200</td>
<td>2.6</td>
</tr>
<tr>
<td>New York Central Railroad</td>
<td>13,900</td>
<td>3,475</td>
<td>21.6</td>
<td>332,900</td>
<td>4.2</td>
</tr>
<tr>
<td>Baltimore and Ohio Railroad</td>
<td>11,300</td>
<td>2,825</td>
<td>23.8</td>
<td>172,700</td>
<td>6.6</td>
</tr>
</tbody>
</table>

TOTAL 129,500

TABLE III

Average Cumulative Percentages of Total Weekly Option Sales, June 5 - July 1, 1955

Largest Weekly Issue(s)  | Average Cumulative % of Total Weekly Option Sales (in shares)
-------------------------|---------------------------------------------------------------
1                        | 7.6                                                           |
2                        | 12.1                                                          |
3                        | 15.8                                                          |
4                        | 19.2                                                          |
5                        | 22.4                                                          |
10                       | 34.1                                                          |
20                       | 49.5                                                          |
concentration is the concentration on the New York Stock Exchange where, for the first 32 weeks in 1955, the first, fifth, and tenth largest weekly volume leaders averaged 2.2%, 7.2%, and 11.5% of total sales, respectively.

For periods longer than a week the concentration in options is less due, once again, to the sporadic week-by-week volume performance of stocks. These week-by-week fluctuations are rather substantial. For the two weeks ending November 5, 1954, there were options sold on 1700 shares of New York Central; during the following week options on 18,500 shares were sold. During the first three weeks of January, 1955, options on 1100 shares of Republic Aviation were written and sold; during the fourth week options on 10,600 shares were sold. And during the week ending October 15, 1954, options on 1,900 shares of Baltimore and Ohio were sold, while during the following week the volume reached 17,500.

It is probably best to look at the relationship between the volume of transactions and market prices when discussing thickness or thinness in a market. The option market for some particular issue would be "thin" if large chunks of options purchased would force option premiums up, the market would be "thick" if large chunks could be handled without seriously affecting premiums. The volume data we already have observed would seem to indicate considerable thinness in the option market even without a knowledge of prices; some of the individual transactions that are made in Stock Exchange trading are themselves much larger than the average week's trading in the same stock in the put-and-call market. Walker, in his SEC
report, cites a case when an option dealer, in meeting an order for price-differential calls on 25,000 shares of Southern Pacific, ran the points above the market price that had to be paid from 3/4 to 3 before he got all 25,000 shares written.\(\textsuperscript{12}\) I have been told of similar experiences by option people. The kind of data one would want in looking for evidences of market thinness are not available. The nominal prices that are available are probably "stickier" than market prices, and they are available only on a weekly basis. When so much time elapses between the quotations "other things" are rarely equal, and there is a problem of identification.\(\textsuperscript{13}\)


\(\textsuperscript{13}\) From the data gathered the following are the best cases of weeks of relatively high volume of trading in various issues and the resulting impact, if any, on the quoted nominal premiums: During the week ending October 22, 1954, purchases of longer than 90-day calls on 9,300 shares of Baltimore and Ohio were made. The premium on six month calls rose during the week from \$287.50 to \$312.50. The stock market price also went up about a point and a half during the week, but the premium on 90-day calls remained unchanged. During the same week purchases on longer than 90-day calls were made on 4,700 shares of New York Central; the six month premium rose from \$237.50 to \$250.00. The stock market price rose \(\frac{1}{4}\) a point during the week, but the 90-day call premium remained unchanged. During the week ending November 5, 1954, purchases of longer than 90-day calls on 7,300 shares of U.S. Steel were made, as were purchases of longer than 90-day puts on 6,500 shares. The premiums remained unchanged. The market price of the stock fell 1\(\frac{1}{2}\) points during the week. During the week ending January 14, 1955, 60-90-day calls on 5,500 shares of New York Central and 60-90-day puts on 4,000 shares were purchased. While the stock market price went up 1 3/4 points, the option premiums remained unchanged. During the week ending January 28, 1955, 30-day calls on 4,800 shares and 60-90-day calls on 2,400 shares of Republic Aviation were purchased. Despite a 2\(\frac{1}{2}\) point market rise in the stock, the options premiums remained unchanged. During the week June 10, 1955, longer than 90-day calls on 3,100 shares of Chrysler were purchased, as were longer than 90-day puts on 2,000 shares. The premiums remained unchanged, as did the stock market price. The first two cases would seem to indicate some thinness, while the other four would not. The limitations on the use of this data mentioned in the text above must be kept in mind.
To sum up the chapter, the data presented show trading in options to be small in comparison with trading in the stocks themselves, that options trading has been increasing in recent years and that it has shown a slight increase relative to exchange trading. While the number of issues on which options are written in the course of a year's time probably is in excess of 500, the bulk of option trading is in a much smaller number of issues, usually the speculative favorites of stock exchange trading. Even in the leading option issues the volume of activity is small; the result tends to be a thin market. Because of the small option trading it is evident that trading activities of individuals are not carried on there on the same scale as on the exchange. Individuals wishing to deal only in large blocks of stocks (say 10,000 shares) would not find the present option market suited to their activities.
CHAPTER IV

THE PUT-AND-CALL MARKET

The purpose of this chapter is to describe the New York option market and the way that it works. The first task is to identify the principal participants whose activities make up the option market. These are the buyers, the writers, and the option dealers, the last group being the central figures. Then the nature of this market is discussed.

The put-and-call market is little known even among persons active in the financial world. A shroud of mystery tends to surround the market, particularly around the activities of the dealers and the writers. Nor are they eager to remove all the mystery. Thus there is much about the market that is known only to those active in it, and much of this is known only to the dealers. So while this chapter attempts to portray and explain accurately the option market, it can only be an approximation to reality.¹

¹The sources of information upon which this chapter is written are the following: an unpublished SEC report—Wm. D. Walker, "Report on the New York Put and Call Market," February, 1944—which is the only piece attempting to describe the option market I have run upon and about which I have heard; numerous articles in financial journals which attempt to explain the use of puts and calls (These are not very helpful for the present purposes.); option dealer and Association literature (which also are of little help here); and numerous conversations with dealers and their hired hands, and others whose activities are related to the option market.

²The only ones who cannot are stock exchange specialists and odd-lot dealers who are prohibited by stock exchange rules from granting or holding options in securities in which they are registered.
but it is difficult to ascertain the identity of those who do.

Inasmuch as most option orders are placed with option dealers through stock exchange brokerage houses, the dealers themselves are not in direct contact with a large portion of the option buyers. There is evidence that the buyers are scattered geographically, with, of course, the exception of New York City. Some foreign option business also comes into the New York market.

On the basis of other considerations, however, more can be said as to the identity of the buyers. The small size of the option market itself limits the size of option operations in such a manner so as to exclude from this market traders who deal only in very large

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3 A check with the New York offices of Merrill, Lynch, Pierce, Fenner and Beane indicated that this was true. Also the business of S. Harnden, an option dealer, seems to verify it. He works directly out of the offices of the E.F. Hutton and Co. brokerage firm and handles their option business. Most of his customers are scattered throughout the Middle and Far West. One limitation on option buying throughout the country (even in New York) are customers' men in brokerage houses who do not understand options (this is true of most of them) or who are not willing to place orders for options. Investors will not put option orders through their broker if the man they deal with does not understand the instruments being purchased. Even if the man knows what puts and calls are, he may be reluctant to place orders for them because of the small fee he gets for his efforts (usually $6.25). It is more work to shop around for options than to buy stock, and there is less in it for the broker. One of the reasons the option dealers maintain channels through which they can be directly approached by the retail customer is to bypass these obstacles.

4 Walker, op. cit., p. 13, cites the case of a South American speculator who both buys and writes options through his New York brokerage house. Since the war, option trading with both London and Paris has been "blocked." There is some activity in Switzerland, and this business comes to New York. (This information was supplied by Herbert Filer of Filer, Schmidt and Co.)
transactions, as was pointed out in the previous chapter. While this does not prove that large investors never purchase options, it does suggest that if they do, they buy them in rather modest amounts. The size of the option market is more suitably geared to the activities of the small investor than to those of the very large investor.  

There are other considerations which would indicate that the small investor is especially attracted to options. Just as life insurance may be unnecessary for the very wealthy individual, so may the use of options as insurance be unnecessary for the very large investor. To the extent that insuring a stock market position is done in order to eliminate the possibility of being wiped out completely or having one's net worth reduced to the point where one's standard of living is threatened, the insurance would not be necessary to a large investor, provided the position in question was not of large magnitude. (And if the position were a large one, it would be difficult to insure it anyway, for the above reasons.) Also, to the extent that an investor believes his expectations are correct he feels he needs no insurance. It has been said concerning the very large professional traders that their egos will not permit them to purchase options. Furthermore, the speculative use of options is more appealing to the small investor, it would seem. The option premium may be the price the small investor has to pay to get in the stock market game; it may be the only means he has of establishing

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5 The possibility should not be ruled out that this particular characteristic of the present market may be due in part to the fact that the large investor is just not interested in buying options.
a sizeable position. This would not be true for the large investor. Thus there are considerations which suggest that option buying is relatively more attractive to the small investor. But again, under some circumstances the large investors may also purchase them.

The writers. The identity of option buyers tends to be unknown because those who have the relevant information haven't chosen to unearth it and to make any sort of an investigation as to who these people are. The identity of the writers of options tends to be unknown, however, because in some cases it is a trade secret of the dealers; in many more cases these investors themselves do not care to be identified as option writers, mostly, it seems, because of the speculative or gambling taint which has traditionally been associated with the option market and the persons operating in it.

In general there seem to be two types of writers. One type are investors who only in certain circumstances are interested in selling puts or calls. Almost always their interest in option writing stems from a desire to make additions to or subtractions from their stock portfolio. If an investor holds some stock whose price he believes to be high and which he is willing to part with, he may try to sell calls, hoping to dispose of the stock and in doing so earn the call premium. Or if it is the purchasing of stock which interests him, he may try to write puts. Or the investor may be willing to buy new stock a little lower than the market price or sell it a little higher; he may be willing to write a straddle on the issue. The type of investor with this interest in writing options may have a large portfolio, but he need not have. These writers are
relatively unimportant in the option market. The number of papers they write is small. At times they offer to the dealers a convenient source of single puts or calls. Or some may be a source of last resort; if a dealer is pressed for getting an option and is willing to pay a high price, some of these investors may be willing to write a straddle. It is believed that at least some of the option dealers foster this type of writer. This source of options may occasionally be a convenience for the dealers, but probably the fostering is done more as an effort to broaden the base of option activity. Of course, investors who become occasional writers may develop into more active ones later. But in terms of the number of papers they supply this group of writers is not important. 6

The usual source for options for the dealers are the "professional" writers. They are interested in writing frequently, on a regular basis; the professional may stand ready to sell options at almost any time, and some of them on nearly any issue. Their primary interest in writing is not to make semi-permanent additions to or

6 The writer is likely to have even more trouble finding a broker than the option buyer does. The writer's broker endorses the contract, thus guaranteeing its fulfillment, and he must be an Exchange member. Because of the unsavory taint that has been historically associated with option trading, many brokerage houses do not wish to have their names adorning the contracts. Merrill, Lynch, for example, reluctantly endorses option papers for only its very largest accounts; it sends the other would be writers to other firms. In a recent letter to the editor of Barron's (September 26, 1955, p. 6), one of the magazine's readers complained of the difficulty of getting a broker to endorse the option contracts he wanted to write, he having unsuccessfully tried "a dozen" of them. Because of all this, writers tend to gravitate to the brokerage firms that will endorse option contracts. These are mostly New York firms, and it is considerably more difficult to write options if one is not trading from that city.
subtractions from their portfolios at favorable prices, but it is to increase the steady income stream which their portfolio yields them. For some individuals writing is their method of making their fortune on the market, or at least maintaining it. It is from these professionals that dealers obtain the bulk of their paper; it has been estimated that 90% of all options come from this source.\textsuperscript{7}

To write options as a "professional" requires a certain amount of wealth. There are two reasons for this. The first is that the writing of each option requires the maintenance of margins;\textsuperscript{8} the second is that profitable option writing, like other forms of issuing insurance, requires the writing of a sufficient number of papers over time to "average out" the risks involved. To get some idea of the amount of capital required, consider an investor who is writing straddles, let us say, on a $50 stock. If, as is commonly done, he buys the stock as a protection against the call side of the straddle, we can calculate his margin requirements. He must margin the put side at 25% of $5,000 and buying the stock at minimum margins will require 70% of $5,000. So he will be required by his broker to put up $4,750 for each straddle he has written. And if to "average the risk" sufficiently he feels he must write an option once a week, let us say, then a man writing 90-day options will have

\textsuperscript{7}This estimate, a rough one, comes from a Filer, Schmidt and Co. employee.

\textsuperscript{8}The essential margin requirements are 25% of the value of the stock on which a put is written, or 30% for a call. Holding the stock can replace the cash margin for a call, or a short sale can do the same for a put. The straddle requirement is 30% cash or holding the stock plus 25% cash. The margin requirements will be treated in more detail elsewhere. These are NYSE regulations.
tied up at any one time about $66,000. Usually the writer will not want to write on just one issue but will want to diversify his commitments among several issues. The more issues he wants to write on with some regularity and the more frequently he wants to write on them, the more money is required of him to satisfy the margin requirements. One option dealer estimates that a portfolio of $50,000 is the smallest upon which options could be written with sufficient regularity to make it worthwhile. This would likely involve writing on but a few issues, probably low-priced ones. So the writing of options in any quantity will involve rather large amounts of money. Unless the small investor is willing to inject substantially all his resources into the writing of options, he would not be able to write on any regular basis. Writing is better adapted for those with relatively large resources.

The professional investors who do the bulk of the option writing are individuals trading on their own accounts. Some own large portfolios of "blue chips" against which they stand ready to sell straddles. Others will sell options on almost any issue, acquiring in their portfolios whatever stock might be necessary to protect themselves against their option commitments. Many of these individuals have had experience in options in European countries, and upon coming to this country, have put their knowledge of option trading to advantage in an area which is little understood by most American-bred investors. The number of these professional individuals is certainly
less than the number of the "occasional" put and call writers. An
estimate of their numbers would indicate perhaps there are forty to
sixty of them. Option dealers are also interested in developing
these professional writers, but it is not easy to find investors with
a sufficient knowledge of market and option trading skills who have
both the wealth and temperament to do this writing. Unless an
investor has had experience elsewhere (such as Europe), he probably
must "grow into" option writing.

The institutional investors would seem to be naturals for option
writing, but in fact it is believed their writing is not extensive.
Some, such as bank trust departments as well as others, are un-
doubtedly too conservative for option writing. Others, however, who
have written substantial numbers of options in such periods as the
1920's are not writing them now. The American Express Company, an
investment trust, is said to have once written options for thousands
of shares against its extensive holdings but now does not write at
all, it being too much trouble to write options on a few hundred shares. It
seems reasonable that the low levels of option activity during many
of the post-1929 years may well have killed off any such institutional
writers who would be interested in writing only in considerable
volume. For one reason or another the institutional writers seem

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9 Average weekly sales of 1200 options would mean an individual pro-
fessional writer would write about 20 to 25 options per week, or from
10 to 12 straddles. This assumes these individuals account for about
8% of all options written.

10 Walker, op. cit., p. 15.

11 This suggests the interesting hypothesis that the present option market
(footnote continued on next page)
not to have entered the option market in a big way. Those that do write options do not care to have their identity disclosed by dealers. Furthermore, their balance sheets and income statements can sufficiently bury any information on option activity so that it is impossible of detection by reading any financial reports. While there is a good deal of secrecy surrounding the institutional writers, my impressions suggest a rough estimate of their option contribution as 5% of all papers. Inasmuch as institutional investors represent a very large potential as option writers, the dealers attempt to attract them into this activity by advertising as well as other means. The present rather limited institution participation in writing does not indicate much success to date on the part of dealer efforts. Nonetheless, this may well be an important future source of options. 12

While the "occasional" writers usually write either puts or calls at any one time, the professional writer almost always prefers to write straddles. One reason for this preference for straddles is that margin requirements can be more favorable to the writing of

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(footnote continued) may be both too big and too small for its writers. There are indications that the relatively high present levels of activity are straining the capacity of the present writers, yet it may not be of sufficient size to once again attract the large institutional investors into writing.

12I have recently been told of a leading Eastern university that has begun writing options on their portfolio at the bidding of one of its influential trustees. They did so after the trustee, a leading industrialist, assured them a yield of 15% on their capital.
straddles than the single options. The theory behind the margin requirements for a straddle is that at any given time, it is only profitable to exercise one half of the straddle; one margin will "protect" both sides; thus the larger of the two cash margins is applicable. If, therefore, a writer writes an option on an issue in which he has no stock position, the straddle would require no more margin than would a call. If, however, the writer is going to assume a stock position upon the writing of an option in order to protect himself, a cash margin will also be required of him.\textsuperscript{13}

A second reason for selling straddles is the possibility of obtaining favorable tax treatment. A premium which the writer receives for an option is considered as ordinary income if the option goes unexercised, and thus these premiums are subject to the personal income tax. If an option is exercised, however, the premium is considered as a reduction in the buying price or an increase in the selling price of the stock involved, whichever is applicable. If the stock involved is in the long-term category the premiums of exercised options are subject to the capital gains tax rather than the personal income tax. While a single put or a call may frequently go unexercised, it is very seldom that one of the sides of a straddle is not exercised. Thus by writing straddles it may be possible to have all premiums taxed as capital gains by having the entire premium

\textsuperscript{13}A long position can totally margin a call or the call half of a straddle, but the put half would still need the 25% cash margin. A short position can totally margin a put or the put half of a straddle, but the call side in this case would need the 30% cash margin. It is impossible, of course, to totally margin a straddle by stock positions.
go against the basis of the stock. The note of uncertainty must be
inserted, however, because there is some doubt as to whether or not
it is legally appropriate to apply the entire straddle premium
against the stock. Until a final ruling is made, some writers
are treating their premiums in this manner, and for them selling
straddles is advantageous tax-wise.

A third reason why writers prefer writing straddles is that in
so doing they feel they can avoid substantial costs of buying and
selling stock. If these costs were zero or negligible the writer
would sell options on an issue in that form (put, call, or straddle)
which would yield him the most in premiums. Then he would buy or
sell stock so as best to protect himself (or minimize the variance
of his expected future costs). The conversion costs may be so
substantial, however, that the writer may be better off in terms
of his expected profit and its variability to change the form of the
options he writes. Thus it may pay to write one straddle instead
of two calls even when the premium money he received would be less
in doing so.  

For these varying reasons professional writers prefer writing
straddles, then, and for the most part do so.

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14 The question is whether or not the straddle premium should be split
into two premiums: one for the put side and one for the call side.
The premium for the side exercised would go against the basis of the
stock, while the other premium would be considered regular income.
Those who oppose splitting the straddle premium contend that if they
sell a straddle for $600, say, it is improper to consider their
getting $350 for the call and $250 for the put. (If these are the
"going" prices.) For they would never have sold the call alone for
$350. If this contention is correct the "going prices" for single
options do not reflect to these writers their actuarial value. Taxes
and options will be treated more thoroughly elsewhere.

15 This point will be treated in the theoretical section.
The option dealers. The option dealers are the heart of the put-and-call market. They are intermediaries between option buyers and writers; their activities make the existence of the option market possible. The dealers are all members of a trade association, the Put and Call Brokers and Dealers Association. To qualify for membership one must carry on a more or less active option business. Almost all the members exclusively deal in options, but a few also deal in over-the-counter securities or have a general brokerage business. There are about twenty-two dealerships; from the personnel of these come the twenty-six members of the association. The number of dealers and Association members has been a declining one; in 1945 there were twenty-eight dealers, each with one Association member; in 1940 there were forty-three dealers; when the association was founded in 1933 there were over fifty. A part of the decline can be attributed to the death and retirement of members. Much of it is undoubtedly due to the dropping out of the option business of inactive members, the inactivity being largely brought on by the relatively

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16 We have been calling them dealers and shall continue. In the usual financial jargon they would be better described as "broker-dealers," for at different times in the course of their activities they serve both functions. Because the usual distinction between a "broker" and a "dealer" cannot always be clearly made in this market and because the distinction does not appear important here, we shall refrain from using the more cumbersome term and shall always speak of them as dealers.

17 One firm, in addition to being an option dealer, advertises itself as a "brokers' broker."

18 The present Association membership list (undated). The reason for the slight hedge on the number of dealerships is that in some cases two dealers work out of the same office; in practice they may really consist of but one operation. But the Association list indicates twenty-two dealers.
low levels of option trading in the post-1929 years as opposed to the trading during the late 1920's. There has been no corresponding number of new dealers and Association members. There is only one dealer on the present membership list who was not on the 1945 list.

All of the dealers are located in New York City, all but five of them in the financial district. The New York market is the only organized option market in this country. The Association claims that all but an insignificant fraction of the options sold in New York are purchased through Association members, and it seems fairly certain that this is substantially correct. There is no way of knowing at the present time what the volume of option activity is that occurs outside the auspices of the Association. In the mid-forties there were a few firms dealing in options who were not in the Association. One of the larger firms kept out of the Association in its first years during the 1930's, and undoubtedly there were several smaller ones who also did. Very likely the holdouts were (and are) interested in maintaining as confidential certain aspects of their businesses, such as the identity of their writers.

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19 In 1945 there were three dealers who operated outside of the financial district, one in New Jersey. Two of these are no longer Association members; presumably they are no longer in the business.

20 Oliver J. Gingold, "Option Trading Acquires New Vigor," Barron's, May 22, 1944, p. 20, and Walker, op. cit., p. 8. One of the holdout firms named by Walker was listed as a member in 1945, but it is not on the present membership list. Walker gives some indications that the business of the holdouts was more at the wholesale end of the market than the retail end.

The typical option dealership is a small operation in terms of its personnel and physical facilities. The necessary facilities are not imposing: the essentials consist of a New York Stock Exchange ticker tape and a good supply of telephones. The complete offices of one of the largest dealers, for example, are housed in one relatively small room. In this room a ticker tape runs between four desks which are bunched together and at which sit four traders, each with a couple of telephones. As the traders reach agreements and make contracts on the phones, they vocally transmit the details to a girl who immediately records them. A second girl types out contracts, a third serves as switchboard operator and receptionist. And this is the extent of the office. Some of the option dealers do not maintain separate offices of their own, instead they work out of the offices of a brokerage house where the ticker and telephone facilities are available.

Almost all option business is transacted via telephone and telegraph. While the dealers do deal directly with retail customers, most orders are placed with them by customer's men or order men from the regular stock exchange brokerage houses. If a call from a brokerage house results in an option sale, the house gets a small commission, usually $6.25.22

The many roles of the dealer in the market are well illustrated by observing the possibilities open to him in supplying an option to

22And, if the option is subsequently exercised or if the retail customer trades in stock against his option, the broker will receive the regular stock transaction commissions.
a retail customer. Suppose the dealer receives an order for a 90-day call on U.S. Steel at the market. The dealer will quote the going option price and, if this price is acceptable to the customer, he will attempt to get the paper. He may seek an identical paper, in this case the 90-day call. It is conceivable that the dealer may have such a call in his option inventory; the dealer may try to purchase the call from a writer; the dealer may write the call himself; or he may turn to another dealer to get it, buying it at a "wholesale" price. Another possibility is that the dealer may have in inventory a 90-day put on U.S. Steel; he can convert, or have converted, the put and supply the call to the customer. Or the dealer may buy a put and convert it to supply the call. To supply the call the dealer may often purchase a straddle, keeping the put side for future resale. Thus the dealer has considerable flexibility in his response to an option order.

All the dealers will occasionally write options, but none do it as a regular practice. The occasions when they are most likely to write options themselves are those times when they can meet an option demand from no other source. Thus the writing of dealers is done more for convenience than for profit, although the writing may well be profitable. The fact that the dealers do not write many options themselves does not mean, of course, that they have found it unprofitable. The relations between a dealer and his writers may suffer

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23 How these inventories come into existence will become clear shortly.

24 The firm Godnick and Son until recently had the reputation of being the only dealer to do a sizable amount of writing, but they now have ceased writing in quantity.
if the dealer writes in any volume himself; the writers may believe the dealer is keeping the best writing opportunities for himself and turning the others over to the usual writers. But more important, the dealer's capital may be used more profitably financing his activities as an intermediary rather than as a writer.

For newly written options the dealers almost always turn to the writers. While occasionally they may be able to purchase single puts or calls as they need them, they usually buy straddles, using one half of the straddle to supply the request at hand; the other half goes into the inventory of the dealer. We previously have pointed out the advantages accruing to the professional writer in writing straddles. There is a quid pro quo; it is the price at which dealers obtain straddles. The dealers must, in fact, pay sufficiently less for the straddles than they would pay for a put and for a call purchased separately, so as to compensate for the costs of maintaining the resulting inventory. On rare occasions a dealer might purchase a newly written option from a writer even though he has no immediate need for it; to do this the price must be considered sufficiently low.25

It is in these transactions with the writers that the dealers accumulate an inventory.26 In the course of his business the dealer's

25 Thus a dealer will at times make a market in both directions: for the writer as just noted, and for the retail customer by writing paper himself.

26 The dealers will often purchase unexpired options from retail customers in order to establish for their customers tax gains or losses. These tend to be exercised immediately and not held in inventory. I (footnote continued on next page)
inventory can get rather large, and he may have a good deal of money invested in them. For one of the large dealers it has been estimated that at any one time the average number of papers in inventory might be about one hundred and fifty. The very nature of the inventory makes inventory policy important for the option dealer. Every option he holds gives the dealer a stock market position, and the value of this position is constantly changing due to movements in stock exchange prices. And on balance the larger the inventory the greater the possible fluctuation in its value. The position a dealer has because of his inventory is not, of course, the one he would be taking were he interested in "playing the market." While it is conceivable that in the long run prices tend to move so as to make dealer inventories profitable, the dealers are not anxious to hold inventories with such profits in mind. They do not consider the purchase and exercise of options as one of their appropriate business functions, and they

(footnote continued) have also heard of the following type of transaction which would add to inventories. To induce a writer to write an option on a relatively obscure and inactive stock it may be necessary for the dealer to purchase not only the option he desires, but also an additional option or options on some actively traded issue. I am unable to explain why the inducements to write options on obscure stock do not take the form of high premiums.

27 This would be true so long as the proportion of the inventory held in the form of puts does not change appreciably as the size of the inventory changes. A large inventory with a nearly even balance of puts and calls would conceivably have a smaller variance than a smaller portfolio composed predominantly of either puts or calls.

28 The aversion of dealers to acquiring inventories in the hopes of capital gains should not be considered as an indication that they believe this line of activity would be unprofitable. It may or it may not be. Because of the dealer's strategic position in the option market he has several possibilities for profiting from options which come into his possession, and waiting for favorable price changes may not be the most profitable of these.
do not make option purchases with this kind of profit in mind.

Once having acquired an option in his inventory there is another aspect of the nature of the option which is an inducement to sell it as quickly as possible. The option contract has a life of limited duration; the passing of each day means one less day remaining in the contract. Other things being equal the fewer the days an option has to run, the less its value. The is the "erosion effect" of time on option values. Unless an inventory option is sold, it will be valueless in due time.

Because the holding of options give them a risky and uncertain stock market position and because of time erosion on inventory values, the dealers are interested in keeping inventory turnover high. In their advertisements in the daily New York papers and in the Wall Street Journal they quote prices for inventory options; these listings are called "specials." One of the reasons the dealers try to foster direct contacts with retail customers is that in dealing directly with these customers they can at times call their attention to specials which may meet the customer's requirements as well as newly written options would. An order man from a brokerage house would presumably not have the flexibility that the ultimate buyer himself has in deciding whether to buy the specials or not.

The dealers claim the advertised specials are priced more favorably than are newly written options. However, in a small sample made this claim was not substantiated. Some papers were favorably priced, some were definitely over-priced, while most were roughly comparable in
price. Although the advertised prices then were not particularly favorable on the specials, there is much more room for bargaining with the dealers on the prices of the specials than on the prices of newly written papers. The special prices after bargaining may well turn out to be favorable vis a vis prices of newly-written options.

It appears that dealers use different strategies in their advertising in two respects. First there is the choice of which of the papers a dealer has in inventory to advertise. Of those who regularly advertise in the New York Times one dealer shows a tendency to advertise those options for which market price movements have been favorable: the present market price puts the contract "in the money"; these carry a higher premium, of course. Another tends to advertise

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29 The advertisements appearing in the New York Sunday Times were studied for ten weeks for which SEC nominal prices were available. From all the options advertised, those for which nominal prices were available were segregated. Then comparisons were made between the advertised premiums and the quoted one. Many were not comparable because of differences in the lengths of the options. Adjustments were made for differences in the prices at which the papers were written by use of the old rule of thumb: an option premium should change in value by half the distance between the market price of the stock and the option price (the rule is at best a rough approximation). From all the papers advertised (over 400) there were only 1\(\frac{1}{8}\) which could definitely be called either over-priced or under-priced as compared to the nominal prices. And of these 1\(\frac{1}{8}\), 30 were over-priced and 1\(\frac{1}{8}\) were under-priced.

30 It is not surprising that there should be some "give" in the premiums of specials when for the dealer the costs have already been incurred as opposed to prices of newly-written options on which the dealer has not yet made any commitments.

31 If it were possible to meet margin requirements for options with other options some of the need for advertising strategy might disappear. Dealers could then always sell their specials at market prices, in effect, by writing new options identical in all respects with the inventory options except for the price at which they are written. But options are not allowed by the Exchange to margin other options.
options "out of the money" which go for lower premiums. The former strategy appeals to those who want a paper profit at something of a discount to start with in purchasing an option; the latter appeals to those who want to reduce the dollar cost of the option. Probably a more important respect in which dealers' strategies vary, however, is in the amount of room they allow for bargaining. One of the large dealer claims that his premiums are not subject to bargaining and that he lists lower prices than his rivals. The others (he claims) list higher premiums and the knowing retail customers expect to do better than the advertisement listings. There are at least two reasons why dealers advertise at prices they do not necessarily expect to get. In the first place, as will be pointed out later, the option market is an imperfect one; relevant price information is not easily obtained and very likely there are some investors who, not knowing they can do better, pay the advertised prices. The second

32 Of the three dealers who do advertise more or less regularly in the Sunday Times a small sample yielded the following results: for one dealer, out of 179 listings, 69% of them were at "favorable" prices (the market price had moved favorably to the option buyer); for a second dealer, of 145 listings, 34% were at favorable prices; and for the third, 45% of his 42 listings were at favorable prices.

33 Unfortunately this dealer does not usually advertise in the Sunday Times and so he was not included in the small sample discussed in the footnote above. One of the three dealers who was included over-priced his listings on fifteen occasions and under-priced on one, a second dealer over-priced thirteen times and under-priced eight times, while the third was over-priced twice and under-priced nine times. The ability to make comparisons in this sample was so limited, however, that these results are not very meaningful.
and more defensible reason for so advertising, is that it is an Association rule that advertisements be considered firm offers. By pricing them a little high the dealer can protect himself from overnight developments which would affect option prices. However, it is doubtful if many (or any) significant "overnight developments" actually do occur such that the dealer really needs to be constantly protected in this manner.

Inventory problems would be much more difficult for the option dealer were it not for the possibilities of option conversion. The buying public is mostly interested in purchasing calls. The writers sell straddles. To meet the demand for calls the put side of the straddle can be converted and a call sold. The conversions keep the dealers' inventories from being flooded with puts which are not in market favor. To do the converting requires capital; the conversion of a put into a call requires that the stock actually be purchased. The option dealers usually do not invest their own capital in conversion; they establish a working agreement with a stock exchange member firm who does the converting. The one put-and-call dealer who is also a member of the New York Stock Exchange, Simons, Linburn, and Co., specializes in conversion; most of the firm's business is in the wholesale option market. Thus an option

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34 Because of the possibility of conversion the price of call should never exceed the price of a put by more than the cost of conversion, and vice versa. The price the dealer pays to a writer for a straddle probably is usually significantly low so that the dealer can convert the put side, sell the resulting call, and make his "normal" profit.

35 Simons, Linburn, and Co., "farms out" some of their converting to other member firms who perhaps have free capital. Walker, op. cit., pp. 11-12, cites the member firm, Newburger, Haus, and Co., as one firm working with Simons, Linburn, and Co., which keeps about $1,000,000 invested in option conversion.
dealer in meeting a demand for a call, can bring a put to his converter and receive a call which is identical with respect to length and exercising price. The arbitrager who converts the put completely protects himself from future price movements by buying the stock.

The New York Stock Exchange limits the minimum its members can charge for conversion. The minimum is a) an interest charge at the minimum rate of \( \frac{1}{2}\% \) above the call money rate on the capital involved in the stock purchase for the option period, b) two floor brokerage commissions and c) the stamp tax. No adjustments may be made in these amounts after the option is sold.\(^{36}\) In recent months the actual interest rate charged has often been six per cent or even more. This reflects the tight money market, of course, but also the limited amount of funds attracted to the riskless arbitrage in conversion. And the limited funds probably reflect the hesitancy with which much of the financial world approaches the option market.

In addition to the converting, which can be considered as a kind of wholesaling, there is a wholesale market in options among the dealers. If a dealer cannot get a paper from his writer contacts he can turn to a fellow dealer. The wholesale market is usually a more costly source; if the retail-writer premium spread is the same, two dealers must be splitting the profit. The discount at which an option

\(^{36}\) Information supplied by Exchange official. This stipulation has been added because the option dealers used to seek a rebate in the event the call contract was exercised a substantial time period prior to the end of the original option period. The converter in these cases can eat his cake and have it too. The Exchange now forbids rebates of any kind, which, in effect, prevents competition of its members from reducing the returns in this profitable sideline.
can be purchased from this source varies from time to time and trans-
action to transaction; there is no fixed schedule. It has been
suggested that the discount varies from $12.50 on the low-premium
options to a high $50.00 on the large-premium ones. The dealer may
purchase newly-written options or specials in this manner. The larger
dealers make less use of the wholesale market than do the smaller
ones; the larger dealer almost always can get his paper from writers.

These are the various methods the dealer has to meet the retail
demand for options; each method has its own cost considerations and
these will vary from time to time. As we have indicated, for the most
part it is cheaper for the dealer to turn to the writers for his
options, but there may be instances when the inside market offers
more favorable terms. On some occasions the amount of his working
capital will influence his method of trading. The availability of
the opportunity to have options converted by others will at times be
determining. The level and content of his inventory obviously is
important. It is in this complex set of operations that the option
dealer through his buying and selling, writing and converting, seeks to
gain his profits.

Because of all these alternatives it is difficult to say what an
average profit might be for a dealer on any average transaction. These
would, of course, vary from circumstance to circumstance and in many
instances the dealer's ultimate profit would be uncertain because
part of the transaction would involve putting the dealer into a market
position with an uncertain outcome. Because of this uncertainty it is
not surprising that ultimate profits may at times be very large. And
at other times they will be negative. On the thirty-day option with
the fixed price of $137.50, the dealers' profit will be $6.25 or
$12.50, depending upon whether the writer nets $112.50 or $118.75.37
While the price structure is perhaps most standardized on these
thirty-day options, they comprise a very small percentage of all
options sold. The dealers say that on single options they buy and
resell immediately their profit usually amounts to 10% of the
premium. But on transactions covering more than 100 shares of stock,
this percentage is less. Unfortunately the data which would permit
more precise statements as to the dealers' profits on single
transactions or total transactions are not available, and the
precise statements cannot be made.

All the principal financial markets are "two-way" markets in
the sense that, within limits, they offer the speculator the
opportunity to buy or sell at his discretion the commodity being
dealt in. The present put-and-call market is not a two-way market.
The institutional framework of this market is directed almost
entirely to furnishing the retail customers with the options they
demand. The originating force in the market is the retail customer.
When he calls the dealer for a paper, the dealer in turn contacts a
writer who can supply the option. The market does not work the other
way; the writers do not contact the dealers when they have options
they have written, instead they are contacted when there is a demand

37The customer's broker and the writer's broker each receive $6.25.
This fee is more or less standard on all option transactions.
for paper. A two-way market is in small measure approximated by
the practice which has developed of writers selling straddles to
dealers, even though the dealer may want only a call. But the
measure is small, for the writer cannot sell a straddle unless the
dealer has a buyer for one of its halves. The explanation of this
two-way market lies primarily in the fact that the option market is
such a thin one in most issues. The fact that the option is a
perishable good is also of importance, but if the market were
considerably thicker it could be a two-way one even though the option
deteriorates naturally with the passage of time.

An imperfect market. There must be perfect knowledge in a market
among the buyers and sellers as to buying and selling opportunities as
well as to prices if that market is to qualify as a perfect market of
economic theory. Such knowledge is a scarce commodity in the option
market, and elements of imperfection result. There is no formal
daily means of communication among the dealers, much less the investing
public, as to such market details as prices and volume of activity.
The price information available to the public consists of the adver-
tisements of specials which appear in the daily newspapers, similar
listings which some of the dealers mail to customers on post cards,
and a list of premiums for 90-day puts and calls written at the market
on selected issues which appears occasionally in the Wall Street
Journal in the "Abreast of the Market" column. The list is billed as

38 There are exceptions, but they are rare. There are occasions when
a dealer will, as a favor, buy an option from a writer even though
he has no retail request for it. This is not a common practice.
the offerings of "a dealer." We previously mentioned that the premiums which are advertised are often subject to bargaining. The premium quotations for the 90-day papers are also a little higher than actual market figures that prevail when the quotations are drawn up. They are put a little high to protect the dealer during a or 5 day time lag that occurs between their preparation and their publication. So the published price material available to the public is scanty and it also does not always reflect the true level of market prices. No data on the volume of option activity is available. As a result the investor cannot be well informed on goings on in the option market.

The dealer also has no formal channels of information as to prices and volume of total option activity. The Association does not compile price lists, nor are the volume statistics it collects furnished to the members. Nonetheless, the dealer knows rather well from his own activities and his continuous contacts with the rest of the market the volume of activity and the terms on which it is done. The dealers observe one another's advertisements closely, and should the need arise for one of them to turn to the wholesale market for an option, they are in direct contact. But even more important is the fact that in dealing with retail customers who "shop around" among the dealers and with writers who write for several dealers, the dealers soon discover if their price quotations are out of line with the rest of the market. All of this constitutes by no means a perfect system of communication for the dealer, and there is not perfect uniformity of price among them. For the stock issues in
which there is most option volume the price discrepancies of $25.00 or more are probably not too common; discrepancies of $12.50 are probably rather frequent. On the less active issues there would likely be larger discrepancies. Both because of the difficulties in evaluating options with varying characteristics (the number of days, the distance from the market, etc.) and because their premiums are bargainable, and therefore variable, to begin with, the market for specials probably shows less uniformity than that of the newly-written options. There may also be significant price discrepancies between the small versus large option dealers. A small dealer with limited writer contacts may be competitive premium-wise only on certain issues. His quotation on other issues may be well above the going market premium.

In any market as imperfect as the option market the person on the inside has a marked advantage over the one on the outside. The dealers' positions in the option market is one which could conceivably be used to unfair advantage, and it has been so used in the past. The following passage from Walker notes well some of the possibilities:

The principle of dealing fairly with the customer probably is not recognized in the option business, except where competition brings it to the foreground. Public ignorance of the relationships existing between fixed premium and variable-premium options may be costly. If a customer is uninformed he may be willing to buy a call exercisable at 2 pts. up for 137.50 when the dealer can buy a call at the market. Or, as in a case cited by one dealer about another dealer, a customer with only $125.00 to spend might be sold an option exercisable so far from the market as to be valueless, while the dealer was buying and putting into his safe an option of the same type exercisable close to the market. In effect, this dealer obtained a valuable option free because the
customer did not have a full $137.50 to spend. Perhaps the most despicable trick of the trade, and one concerning which we do not know the frequency of occurrence, is chiseling between stock prices on the ticker. The option dealer sells to a customer, who is not near a ticker, an option in which the stock's price of the moment is dishonestly stated. This could not happen, of course, if an alert customer's man or order room handled the order.

The option buyer has little opportunity to become informed unless he shops around among the dealers and learns about markets and values, or has his customer's man do this. There are no published option sale prices and relatively few offering sheets, and nothing whatsoever is divulged concerning the inside market. Dealers who are willing to indulge in unfair pricing practices have ample opportunity to do so, for there is nothing standard about the commodity they are selling.39

While the above colorful passage points out well the opportunities inherent in such an imperfect market, I believe the amount of such behavior implied in the passage is not in fact present in today's market. Very strong pressures against it come from the brokerage houses. If one of their customers finds he has paid more for an option than was necessary, he complains to the broker through whom he placed the order; the broker in turn objects to the option dealer. The dealer is then on the spot, for maintaining good relations with the larger brokerage houses is important to him. While the retail customers themselves may be widely scattered one brokerage house may do the purchasing for considerable numbers of them; the houses have economic power which they can bring to bear on the dealers to obtain a "fair deal." So from this source there is pressure on the option dealer to keep in line.

The dealers themselves have attempted to meet this problem through their trade organization, The Put and Call Brokers and Dealers Association, Inc. The role of the Association in the market seems to be almost entirely one of self-policing. The article from its constitution on aims and objectives states:

The aim and objects of the Association are to foster the maintenance of high standards of integrity and honor in all business dealings by its members; to prevent any trade practices which are not conducive to harmonious relations among its members and to efficiency in the conduct of their business, and thus to enable them to better serve the persons with whom they deal, or on whose behalf they act; and to provide for the settlement by arbitration of all the differences and disputes arising between its members and otherwise to promote their welfare. The Association will seek to attain these purposes consistent with the principle that it is not organized for pecuniary profit.\(^{40}\)

Apparently the original purpose of the Association was to band together the legitimate option dealers who were doing business in the rather haphazard option market which existed in the early 1930's. The Association introduced the policy of having all contracts sold through its members guaranteed by Exchange member firms; thus option buyers could be confident of having their contracts fulfilled when they purchased them through Association members. This original need for the Association has vanished as the slip-shod dealers have vanished. The present activities of the Association seem largely to be arbitrating the differences between members and between members and their customers (Since practically all business is conducted over the phone

\(^{40}\) Association, Option Contracts, p. i.
it is easy to see how differences over contract details might arise.), policing dealer advertising, acting as a liaison between the dealers and the SEC,\textsuperscript{41} putting out publicity material on the business, and keeping an eye out for such unhealthy developments as excessive buying of options on inside information. While these activities undoubtedly contribute toward a more honest and orderly market, the Association has not taken effective measures to eliminate the most important cause of the market imperfection which gives rise to many of the problems in the first place: they have not made available to the public adequate information on market activities. Doing so would seem to be a natural step for the Association to take.

While the publishing of option premiums and the volume of option activity would almost surely increase interest both in option buying and writing, the dealers themselves appear not to want to make this improvement. Much of their present profit seems to stem directly from the market imperfections we have been describing, and the thought of higher volume and lower profit margins apparently has no appeal for them.\textsuperscript{42}

We have concentrated on the problem of the buyer facing an imperfect market. The plight of the writer in these circumstances is less crucial because the writer is usually an experienced investor of some financial means, and he is better prepared and better able to watch out for and protect himself. The writer has some knowledge

\textsuperscript{41}The SEC has the power to regulate option trading, but has never exercised it. See Louis Loss, \textit{Security Regulation}, p. 306.

\textsuperscript{42}Professor James Lorie of the University of Chicago School of Business pointed this fact out to me.
of what the dealer is getting at the retail level for options from observing the advertisements and listings in the papers, and in this way he can keep a (crude) finger on the level of premiums. But more important than this to him is the fact that by constantly being aware of the "pulse" of the stock market and by observing the acceptances or rejections of his bids and quotes by dealers, he can try to keep up with the level of premiums which the writers receive.

**Market impurities.** In addition to the imperfection in the market there are also elements of impurity. As an intermediary, the contacts a dealer maintains with both writers and buyers are the life-blood of his business. The put-and-call market is a very personal market; very often the key contacts for a dealer are personal ones. Every dealer probably has some isolated segment of the market, large or small, which he serves exclusively. For example, a dealer may work out of the offices of one of the large brokerages houses and do all the option business of that house. Another may exclusively serve a handful of writers he has developed. Many of the smaller dealerships may do little more than serve that part of the market with which they have established these relationships. While the larger dealers have attempted to broaden the base of their activities by establishing general non-personal market contacts with writers, brokerage houses, and retail customers, they too have a few customers or writers who they serve exclusively. The importance of the personal contacts tends to keep the dealers independent of one another, for their contacts are carefully guarded secrets. This independence is most likely responsible for the failure of the Association to
distribute market information even among the dealers. It also has tended to make the wholesale market in options relatively unimportant. The public's imperfect knowledge about the market and the terms of the trading in it makes easier the maintenance of the personal contacts, of course, and so it is a factor in their importance in the present market.

We have already observed that the numbers of dealers is small (22). There are also considerable variations in the size of the dealerships. Some are one-man operations; others are much more than that. There are four firms that are substantially larger than the rest in terms of their shares of the retail market. A fifth may be just as large, or even larger; it is Simons, Linburn and Co., the firm which is also an exchange member, whose activities are more directed toward conversion and the wholesale market. One of the four large retail dealers estimated his firm did one sixth to one fifth of the retail option business, and that they were as large as or larger than any other dealer. Probably the four account for between three-fifths and three-fourths of the retail market.  

\[\text{43}\] The four are Godnick and Son; Filer, Schmidt and Co.; Thomas, Haab, and Botts; and Paul Karp. These are also the four firms which actively advertise in the daily papers.

\[\text{44}\] Data are not available which would allow precise statements here. For a six year period, 1930-1935, the SEC has some volume data on a per firm basis. They relate to 26 firms which were members of the Association in 1935. The data are complete for the 26 firms for 1935, but they are progressively less complete for the earlier years. In many instances the figures are estimates. Moreover, it should be remembered that many firms, some of them large, were not in the Association in 1935. Subject to all these limitations, the following percentages give some indication of the concentration for the four years for which the data were most complete for the 26 firms:

(footnote continued on next page)
Whatever market control these firms may enjoy because of their size, it does not generally appear to be passed forward onto the retail customer in the form of higher premiums. In fact, because of the manner in which they seem to be trying to expand their businesses, they very likely are among those selling options with the lowest premiums. There is some evidence that they exercise their market power backwards on the writers to some extent. Because they are outlets for large-scale writing, they may be able to obtain their options for less than a smaller dealer can.

There is one further element which we must consider. For the dealers there are economies and advantages of scale just as there are in almost all other areas of enterprise. There are cost indivisibilities. A single trader must have available a stock exchange ticker, but several traders may be able to use the same ticker. One secretary may be able to handle the routine chores for several traders, etc. Thus the somewhat larger operation may have an advantage cost-wise over a smaller operation. Even more important than the cost considerations are the advantages enjoyed in dealing with writers and retail customers. Unless he can purchase options in sufficient quantity

(footnote continued)
and variety from his writers to keep them satisfied, they may prefer to write for a dealer or dealers who can keep them busy. Thus being able to sell many and varied options helps the dealer maintain writer contacts. And unless sufficient contacts with writers are maintained, the dealer may be forced to purchase options to meet his retail demand from the more expensive wholesale market source. So the coordination of the two sides of his activities is made easier if the dealer operates on a large scale. The large brokerage houses almost certainly prefer dealing with the larger option dealers.

In a market where these many factors must influence the competitive conditions, what is the resulting pattern? It seems to be this: The large dealers tend to set the "competitive" pattern and level of prices in their transactions. They are large enough and have sufficient contacts with writers to be able to sell efficiently options on a wide variety of issues and in some quantity. They compete among themselves in many segments of the market as they serve many of the same brokerage houses, advertise in the same mediums, and buy from many of the same writers. They attempt to reach into as many market segments as possible to keep their trading at high levels and on broad bases. Because of their ability to purchase large quantities of options from writers they perhaps can buy options more cheaply from the writers than the smaller dealers can.

A smaller dealer serving a captive retail market probably sells at somewhat higher prices than do the larger firms, hewing the lower price line where necessary. His costs of obtaining options may be somewhat higher than the costs to the larger dealer. If the small
dealer has writers writing exclusively for him, he may be competitive with the large dealers on the issues they furnish him, but on other issues he may not be.

In a market where knowledge of prices is as imperfect and where personal contacts are as important as they are in the option market, there is bound to be considerable distortion in the behavior in the market from that which would appear under more ideal circumstances. The activities of the larger dealers through their efforts to expand the bases of their operations have resulted in pressures against both the imperfections and the influence of personal contacts. While the publication of the details of market activity would put strong pressure on these market characteristics, this development is not likely to be forthcoming in the near future because of strong internal resistance to it.
CHAPTER V
OPTION TRADING AND SOCIETY

The activities of speculators in the stock market are said to be beneficial to society to the extent that they stabilize stock market prices over time and space and to the extent that they create a thicker—and thus more liquid—market. The foresight of the speculators must be accurate if these desirable results are to be forthcoming. Then speculators buy when stocks are low, thus increasing the demand for them, and sell when they are high, increasing the supply of them. If the foresight is bad, prices do not tend to be stabilized by speculation, but may be aggravated by it. Similarly, if speculators "pile on" rising or falling prices, they may aggravate rather than stabilize the prices. These are the results if the speculators deal in stocks. How does the fact that speculation in stock prices may take the form of option trading affect stock market price stability and the thickness of the stock market?

The answer is not easily come by. For one thing, in option trading two men are involved and the activity of both must be considered. When a trader buys an option, another must be writing it. Furthermore, their option activity leads only indirectly to stock market activity. The initial impact of option trading is to divert speculative activity from the exchanges to the option market; in trying to profit from stock market price movements the traders deal in options on stocks rather than in the stocks themselves. But their option activities have an impact on exchange trading. To take the profits on any option or to convert any option will bring
the holder of it into exchange trading, while the writer also will be buying or selling stock on the exchange if he converts an option or closes out his position on the expiration of an option. So while puts and calls become the focus of the traders, their option activity inevitably leads them to exchange trading. To evaluate the effect of the presence of option trading on the stock market it is necessary to compare this induced stock exchange trading with that which the option traders would have done in the absence of the option trading.

It seems reasonably clear that the persons who buy options do so instead of, or in addition to, trading in stocks themselves. So in the absence of option trading their bullish or bearish expectations would be reflected in exchange trading. There is some question as to what the size of that trading would be as compared to their option volume. For some, particularly the smaller investors, the option activity might be on a larger scale than exchange activity; with a given amount of money one can speculate on more stock via options than he can in dealing in the stock proper. For others there probably is no difference in the scale of their activity in the two mediums.

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1 In practice an option holder can take his profits from an option without a stock-exchange trade by selling the option itself to a third party. This is frequently done for tax purposes. But the third party then exercises the option and makes the off-setting exchange transaction. So in any case stock gets either bought or sold.
It can also be said with some assurance that the option writer would be in stocks directly, were he not writing options on them. Many writers would hold rather stable portfolios in the absence of the option trade, collecting the dividend incomes from them, adjusting them to their long-range goals and expectations, etc. Others, however, would be much more active in the stock market than this. They would be more the speculator type, playing their bullish or bearish expectations for capital gains and trading profits. Nonetheless, it seems rather certain that on the average the writers as a group would be less active in an in-and-out sense than the buyers of options in the absence of option trading, and would be more the "institutional-type" holders of common stock.

The amount and direction of some of the option-induced exchange activity will depend upon the comparative price expectations of the two traders—the writer and the buyer, for this will determine how much converting will be done.² For example, if the expectations of the buyers are such that they wish to buy calls and if the writers' expectations are such that they wish to write puts, transactions between them will be made only if conversion is done by somebody. On the other hand, if the buyers wish to buy calls and the writers wish to sell them, there is no problem and conversion is not necessary. Thus to say something about option-induced exchange trading, it is

²We are neglecting the activities of the option dealers in this discussion. Insofar as they are solely directed toward option conversion they do not affect what follows. We will assume the option writer to write that form of option demanded by the buyer and that the writer then convert his position as he sees fit. That the conversion is done matters, who does it does not matter.
necessary to say something about the expectations of the parties involved. It will be convenient to divide writers into three groups, according to whether they wish to write puts, calls, or straddles. And these groups can be labelled "bullish," "neutral," and "bearish," respectively. Similarly the buyers can be called "bullish" if they want to buy calls and "bearish" if they want puts. Thus a writer willing to write puts and a buyer wanting to buy calls are both "bullish," and we can say they have the "same expectations." Their precise expectations will not in all likelihood be the same, of course, they are only the same in the sense that the above terms have been defined. By specifying the groups that the participants are in, we can say something about the amount of conversion that will be forthcoming.

The impact of option trading is thus dependent upon what the activity of the traders would have been in the stock market without it and upon their comparative price expectations. Furthermore, in observing whether or not the option-induced exchange trading has a "corrective" (i.e., stabilizing) influence upon price, it is necessary to posit various price movements pursuant to an option transaction. Thus there are many possible outcomes. To work through them all is tedious, so the exposition of the cases has been isolated and made into an appendix at the end of this chapter.

A summary of the results can be made, however. With respect to the manner in which option trading affects the number of exchange

\[\text{They may both expect, on the average, prices to rise, but they need not expect the rise to be of the same magnitude.}\]
transactions, the various cases indicate that there is a tendency toward a more active market to the extent that writers, who otherwise would be rather inactive, long-term stock holders, are forced by their writing activities to make purchases of stock more frequently and to the extent that option buyers are able to deal in larger quantities in the option market than they would in the stock market. Contrariwise, to the extent the writers would be actively in and out of the stock market were they not writing and to the extent that the option buyers would be dealing in stocks in the same amount were they not purchasing options, option trading tends to reduce the number of exchange transactions. Also, exchange activity tends to increase when the writers desire to sell options in a form different from the one the buyers wish to buy, for then conversion becomes necessary. This occurs when both parties have "the same expectations." The net effect of option trading may be to increase modestly the amount of stock exchange trading, and this may make for a thicker stock market.\footnote{It is important to note, as Professor Samuelson has pointed out to me, that market activity and thickness are not the same thing. Thickness refers to the number of potential buyers and sellers for small price changes. Markets can be active, but not thick; also they can be inactive, but thick.}

In almost all the examples worked out in the appendix the presence of option trading tended to distort unfavorably the price pressure, exerted by the activities of the speculators. If the pressures were not changed in quantity, they were in nearly every case changed in the time at which they occurred, thus losing some of their effectiveness. There were some exceptions however. If both the buyer and option
writer have the same expectations and if these expectations are incorrect, there is a tendency for option trading to lessen the adverse pressure they otherwise would be exerting. If the option buyer and writer have opposite expectations, if the buyer would only be able to deal in smaller quantities of stock in the absence of option trading, and if the buyer's expectations were correct, then the corrective pressure may show a relative increase with the option trading present. And finally, if the option writer is neutral, if the buyer would deal in less than half the quantity of stock were he not buying options, and if the buyer is correct in his expectations, option trading will tend to increase the corrective pressures on prices from what they would have been. Despite these exceptions, in the bulk of the cases both possible and likely the effect of option trading is to affect unfavorably the pressures from speculative activity on market prices.

The cases examined and the examples worked out considered the comparative exchange activity at the onset and at the termination of the option contract; any activity which might have been carried on in the interim was neglected. To whatever extent the holding of an option encourages a trader to trade more frequently in and out of a stock, there is a tendency for the buyer to exercise more price pressure; if he anticipates the ups and downs of the market price correctly, this additional price pressure will be stabilizing. The reverse would be true if he were incorrect in his anticipations. His activities will also contribute to the market thickness. This "interim" activity is probably not much higher than the pace his
activity would be at if the trader were dealing in stocks.

One other result of option trading on market activity is worth noting. If writers write on issues in which they otherwise would not be dealing, or if option buyers purchase papers on stocks upon which options are available but in which they would not otherwise be dealing, the composition of trading among the various issues on the exchange may be altered by option trading. The usual result here is for trading to increase in the issues in which there is an option interest at the expense of those that are not of option interest. The reverse can occur, however. Since the most active option issues are the speculative favorites of the moment, option trading may accentuate the exchange activity in them by attracting the activity of writers to these from other, perhaps more conservative, issues.

One argument that is made in defense of speculation in markets in which there is futures activity, is that the speculators shoulder the risks of price fluctuations which others do not wish to bear. This is a major justification for the existence of speculation on commodity exchanges, for the futures trading allows processors and suppliers to hedge their inventories of the commodity. The usual speculation on the stock exchange does not perform this function;

As an example of where the reverse would happen, consider the case where a writer writes a call on an issue in which he otherwise would not be dealing. Suppose the call is for 400 shares, and the dealer is bearish. If the price goes down, the dealer being correct in his foresight, no stock is either purchased or sold on the exchange. The buyer would have made some exchange purchases, however, had he not bought the option. Because he bought the call, activity in his stock dropped.
there is no futures trading in stocks on American exchanges that will allow for hedging. Investors can reduce the risks of stock ownership through diversification, of course, and by the use of "stop-loss orders" they can attempt to be protected from adverse price movements, but this device has limitations. Those looking for a means of reducing the risks of stock-price fluctuations can find it in options. And option writers do shoulder for others the risks of these fluctuations. So to the extent that options are used for insurance purposes, the shouldering of these risks would seem to be socially useful.

It is difficult to determine how much of option trading is done for this purpose. The option dealers claim that most options are purchased for insurance, but many considerations make this doubtful. One is that consistently more calls are purchased than puts, the calls costing considerably more than the puts. Since puts would be the natural options to protect long positions, which are by far the more numerous, the prevailing option mix suggests the speculative use. The fact that the issues on which most of the options are written are the speculative favorites also suggests the speculative use of them. The general attitude of the securities industry seems to be of option trading as a highly speculative business. But while the speculative use of options may predominate, they are also used as insurance. This fraction of the small option volume suggests that the insurance is rather unimportant in the whole of market trading. The resulting net diminution, however small, of the mental anguish stemming from risky stock market positions is a measure of the contribution of option trading to the well-being of society.
Apart from the impact on the securities markets which we have already discussed, the use of options for what I have called the speculative use is harder to justify in terms of the benefits from it which accrue to society. Options provide a greater flexibility in security speculation; they provide the market trader with an additional tool with which to play. To those with strong, definite expectations in which they have confidence, options provide a highly-leveraged means of profiting thereby. If this form of speculation cannot be said to perform any notable functions to the benefit of society at large, neither can it be said that it is in any important way detrimental, which in the final analysis is of some significance.

Option Trading and the New York Stock Exchange. Within the securities industry the option market is most closely related to the markets in common stocks. And of these markets by far the closest relationship is with the New York Stock Exchange. One reason for this, of course, is that most options which are traded are written on stocks which themselves are traded on the NYSE. But there are also institutional ties with the Exchange; these we will briefly examine.

An important tie between the Exchange and option trading is the requirement by the option dealers' Association that all the contracts which they sell must be endorsed by Exchange members. The original purpose of this requirement was to provide the reputable option dealers in the disorganized market of the early 1930's with guaranteed contracts which would give them a clear competitive advantage over non-member dealers. The Exchange member endorsement not only serves
to guarantee the contract, it also serves to add luster to option trading. While the reputation of the Exchange and its members has not always been the highest - particularly in the 1930's - at any point in time it is probably a couple of notches higher than that of option trading. This association cannot damage and undoubtedly improves whatever reputation option dealing has. The non-member option dealers are practically extinct now, and the need of the endorsement for competitive purposes no longer exists. One consequence of the endorsement requirement is that the writer's broker must be an Exchange member; because of this the writer is subject to NYSE maintenance margin requirements. The writing of puts or calls are neither purchases or sales of stock as such, and so the transactions are not subject to Federal Reserve Board margin requirements. They are, however, contingent purchase or sales and are held to be subject to the Exchange maintenance margin rules. These stipulate that margins must be kept at 25% of "long" positions and 30% of "short" positions.  

Because the subject of option trading is usually Exchange stock issues, much of the option conversion tends to be done by Exchange members, and it is done under Exchange regulations, as was pointed out previously. Exchange members have lower costs of buying and selling stock than do non-members, and so they have a comparative advantage in converting. The minimum they may charge consists of two full non-member floor brokerage commissions, the stamp tax, and an interest

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N.Y.S.E., Rules of Board, Rule 550 (b). These margins must also be met when an option holder exercises his option and takes his profit the same day; in this case the margins must be kept until the exchange transaction is cleared.
charge \( \frac{3}{2} \% \) above the call money rate on the entire amount involved in either a purchase or sale. The Exchange ruling prevents competition among the members from passing on the lower costs to the option dealers. The one other Exchange rule which is of some importance in option trading is Rule 472 which requires its members to charge and collect full commissions for receiving or delivering securities on an option.\(^{7}\) Because of this rule, member firms undoubtedly collect in regular commissions more in the present market than they would if option trading were abolished. Previously the conclusion was reached that option trading probably modestly increases exchange volume; the commissions are collected both on the exchange volume and the off-the-exchange option volume. (And in addition there are the small commissions given to the writer's and the buyer's brokers when an option contract is sold.)

The option market is peripheral to the stock market and dependent upon it. Indeed, the separate option trading is carried on only because the Exchange's constitution bars trading in options on its floor. The Stock Exchange activity provides the fluctuating prices which become the object of option trading, and also a social status and reputation, some of which is perhaps rubbed off onto option dealing. The option business in turn provides the exchange houses with increased commissions and their customers with an interesting trading method, whether used as insurance or speculation.

\(^{7}\)Other Exchange rules of less importance prohibit specialists and odd-lot dealers from holding or granting options in the issues in which they are registered and floor traders from initiating any transactions in a security in which they hold or have granted an option. (Rules 362, 367, and 371.)
Margin requirements and option trading. Other than general monetary policy, whose effect in this area is uncertain, the major weapon used by monetary authorities in controlling speculation on the stock markets is the Federal Reserve Board reserve requirement policy. How do the changing reserve requirements affect option trading?

First let us consider the way that changes in margin requirements affect the supply of and demand for options because of cost considerations. To the extent that converting is a necessary part of supplying options to the retail customer, whether this converting is done by the writer, the option dealer, or an Exchange member firm, the supply of options will tend to be reduced by increases in margin requirements, for more money must be put up for the purchase or sale of stocks. How the demand for options would be affected is more complicated. Increasing the amount of money needed to take a regular long or short position in stocks would make more attractive the cheaper method of speculation via options. On this score the demand for options would appear to increase considerably. To the extent that options are purchased in anticipation of profiting by frequent trading in and out of the stock, the demand would probably fall because of the greater amount of money necessary to make the off-setting transactions (this probably is not an important segment of demand). The demand for options for insurance purposes would likely fall, because there presumably would be fewer positions taken in stocks with the more restrictive policy. So insofar as the speculative use of options is predominant the result of the increases in margin requirements would tend to be substantial.
increases in the demand for options. With both increases in demand and the fall in supply, option prices would be expected to rise. Option volume could conceivably go either way. However, the substantial increase in demand which would likely stem from increased speculative use of options would seem to be sufficiently large so as to more than offset any reduction in supply, and therefore option volume would be expected to show an increase.

These would tend to be the permanent results from a change in Federal Reserve Board policy; there probably would also be short-term changes in option supply and demand due to the impact of the change on expectations. If the result of an increase in margin requirements were to increase the amount of uncertainty present as to future price movements, this impact would tend to reduce further the supply of paper and to increase the demand for it. The increased demand on this account would not only be for speculative purposes, but also for the covering of positions already taken. This impact on expectations would be a temporary one, however, and traders would soon adjust to the new situation.

The relationship between the average yearly Federal Reserve Board margin requirements and relative option volume is not a clear one. The data for both for the period 1938-1955 are graphed in Figure 1. For the years prior to 1949 there appears to be no relationship; since that time the two series move sympathetically - years with high margin requirements tend to be associated with years of high

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8This is in contrast to the position taken by Walker in his SEC report, op. cit., pp. 26-27.
Figure I. Option Volume as a Percent of New York Stock Exchange Volume, and Federal Reserve Board Margin Requirements, 1938 - 1955

Sources: SEC, Barron's, Federal Reserve Bulletin
relative option activity. If there is anything to this suggestion, the explanation may be that option buying is being done more and more for speculative uses. The data can also be analyzed in a more quantitative manner. Taking yearly data for the eighteen years under discussion, a multiple correlation analysis was made, using option volume as the dependent variable and New York Stock Exchange volume and Federal Reserve Board margin requirements as the independent variables. The simple correlation between margin requirements and option volume was found to be .325, while the multiple correlation coefficient between them, holding the effects of exchange volume constant, was found to be .121. These data suggest a positive correlation between option volume and margin requirements, as we have hypothesized. It must be pointed out, however, that too much confidence must not be placed on these statistical results. With a sample size as small as this one the sampling errors in getting the multiple correlation coefficients are relatively high, and any "reasonable" confidence interval around the coefficient we obtained would extend beyond zero and into negative numbers.

In conclusion, increasing Federal Reserve Board margin requirements tends to increase option prices. Because of the speculative uses of options, option volume after increased margins may be expected to increase. Statistics for recent years indicate that this may have been the case.\(^9\)

\(^9\)In Chapter II, above, the use of options in satisfying brokers' margin requirements was described. The use of options to satisfy Federal Reserve Board margin requirements would be an interesting possibility. (footnote continued on next page)
Option trading and the federal income tax. It is a well-known fact that current income tax laws and the high rates of taxation have added a new dimension to security speculation as well as a new degree of complexity. So it is with option trading. A trader must constantly keep in mind his income-tax situation if he is to wring the last dollar of profit from his trading operations. As is true of transactions in many segments of the securities industry, the tax treatment of option transactions can be carried to the frontiers of taxmankind. The interaction of a complicated method of operation and a complicated tax law can lead to many interesting situations whose tax treatment is uncertain. The following pages are a brief attempt to outline what appears to be the present tax situation in this area.  

The tax treatment a holder of a call receives is clear. If a call is exercised, the cost of the call goes against the basis of the

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(footnote continued) This could be done by giving the customer the choice of margining in the customary manner or by depositing with his broker a put on the number of shares involved in a long account, or a call on the number of shares involved in a short account (minimal cash deposits might also be required). So long as the writers were always able to meet their obligations - the Federal Reserve Board might want to set up new margin requirements for them - the use of options could reduce the possibility of unhealthy credit practices developing between broker and customer. If the practice were introduced, an increase in market speculation would follow, and smaller investors would increase market trading. The stock market would be made thicker, and the speculation would doubtless be less well informed. Needless to say, permitting this use of options would give a tremendous boost to option trading.

10 The principle sources of information upon which this discussion is based are the Commerce Clearing House tax service; "Options and Taxes," a pamphlet published by Godich and Son, option dealer; and "Review of Tax Effect of Internal Revenue Code of 1954 on Put and Call Transactions," two mimeographed sheets distributed by the option dealer Association.
acquisition of the stock; in this case it increases the cost of the stock by the amount of the call premium. The holding period of the stock begins on the date the call is exercised. The actual tax treatment of the call will depend upon when the stock is sold. If it is held longer than six months, the treatment is long-term, if it is not held that long it will be short-term. If a call is "in the money" and there are profits to be made from it, the call itself, which is a "capital asset," can be sold to a third party (other than the writer), and the gain received will be long-term if the call has been held longer than six months or short-term if it has been held for a shorter period. A call which is allowed to expire is treated for tax purposes as having been sold at its expiration date for a zero price, and the cost of the call is a capital loss - long-term if it has been held for longer than six months, short-term otherwise. If it is evident to the holder of a call that a six-month call which he has is going to be worthless at its expiration, it will generally be to his advantage to sell the call for a token price to an option dealer (or anyone else) before he has held the call six months, thus establishing a short- rather than a long-term loss. This is preferable because short-term losses may offset the more highly taxed short-term gains, while long-term losses offset the long-term gains which are more favorably taxed.

The law as applied to puts is less clear. In the Internal Revenue Code of 1954 it is stated that "the acquisition of an option to sell property at a fixed price shall be considered as a short sale";¹¹

¹¹Section 1233 (b). The two sections of the code which relate to options are 1233 and 1234.
thus a put is accorded that treatment. If a put is allowed to expire, 
the cost of the put is a capital loss - a long-term one if the put has 
been held for longer than six months, a short-term one otherwise. If 
a put is exercised and the profit taken by purchasing the stock in 
the market, or if the put is resold at a profit, the gain made is a 
short-term one regardless of the length of time the put has been 
held. If a put is purchased on an issue in which stock has been 
held for longer than six months and the put is exercised by the delivery 
of this stock, the cost of the put is added to the cost of the stock, 
and if there is a gain on the sale of the stock, it is a long-term 
gain, provided that in the period from six months prior to the purchase 
of the put until the date it is exercised or it expires there has not 
been a purchase of identical, or substantially identical, stock by 
the option holder. If the latter is the case, the treatment of any 
gain on the delivery of the stock which exercises the option must be 
a short-term gain. Presumably it is legitimate to resell a six-month 
put prior to expiration so as to obtain a short-term rather than a 
long-term loss.

There is one exception to the ruling that a put must be considered 
a short sale. If a put and stock in the amount covered in the put are 
both purchased on the same day and the stock is identified as intended

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12 This seems clearly to be the intent of the 1954 code. Yet some 
option dealers continue to claim that the put is a capital asset and if 
resold at a gain after being held for longer than six months, the gain 
constitutes a long-term one. See "The Protective Merits of Put and 
Call Options," a pamphlet published by Paul Karp, option dealer, "There 
are 13 Ways to Use Put and Call Options," a pamphlet put out by Filer- 
Schmidt and Co., and various advertisements by the same dealer in the 
to be used in exercising the put, the cost of the option is added to the basis of the stock. If the put is held over six months and exercised with the stock, it is a long-term transaction. Or if the put expires and the stock is sold, the transaction is a long-term one if the stock has been held for six months or longer, otherwise it is short-term. This is a 1954 provision in the code.

The new provision has led some to the belief that it still is possible to make long-term gains by buying a put. Suppose stock and a put are purchased on the same day and are identified together as the provision stipulates. Now suppose that six months later the price of the stock has fallen. Since the trader has, in essence, purchased a synthetic call, with the fall in price he will have suffered a net loss equal to the cost of the call. Or in our example, the stock can be used to exercise the put, limiting the loss on the entire transaction to the cost of the put plus the commissions involved. Instead of doing this, however, suppose the stock is sold a few days short of the six-month limit and a short-term loss taken. Then after the six months has passed, the put is resold and a gain is made of the same amount less the cost of the put. If this gain could be considered a long-term one, it, combined with the short-term loss, could even result in a net profit if the speculator were in a sufficiently high tax bracket and if he had short-term gains to offset. The question of legality is, of course, whether the new regulation exempts such a put from the short sale clause. To the writer, at least, it does not, for Section 1233 (c) requires a put, if it is to be exempt, to be exercised by the stock with which it is identified, and the proposed
transaction does not so exercise the put. In it the put position is closed out by the resale of the option. Nonetheless, the proposal has become the subject of debate in financial circles. One suspects it has been fostered by wishful thinking.

The tax treatment accorded to writers is much more uncertain than that given to the holders of options, because the Internal Revenue Code does not provide for how premiums received by writers other than option dealers should be treated. The Senate Committee Report on Code Section 1234 states, however, that when an option is not exercised, the premium which the writer has received is always to be treated as ordinary income. If the option is exercised, the premium is to be added to the basis of the stock which is either delivered or received when the option is exercised. If the stock transaction is a long-term one, then the premium will get that treatment, otherwise it will get the short-term treatment. On the basis of the Senate Report, this has been the approved method of handling premiums received. The treatment of straddle premiums is more uncertain, as neither the Code nor the Report provide for it. If a writer sells a straddle almost certainly one of the halves is going to be exercised. The tax treatment which is favorable to the writers and which some have been using is to apply the entire straddle premium against the basis of the stock involved when one of the sides is exercised. This is favorable because if the stock has been, or is going to be, held for six months, the entire straddle premium will obtain long-term treatment subject to the lower rates. The alternative method would be to separate the straddle premium into two components - that
corresponding to the put side and that to the call side. Then if the call is exercised, the call portion of the premium would be applied against the basis of the stock delivered and the put portion would be ordinary income. This, of course, makes a difference. Again the appropriate treatment is being debated in financial circles. There will no doubt be a ruling on this matter in the not-too-distant future. In the meantime some of the larger option dealers are assuring their customers that the favorable treatment is the one to be using.\textsuperscript{13}

Because of the lack of rules in the code itself the writers have more flexibility in their taxmanship than do the buyers of options. Suppose, for example, that a writer has in his portfolio stock which he has held for longer than six months and suppose he has a call outstanding on this issue which, because of a rise in price, he knows is going to be exercised. He has a choice of strategies. He can deliver some of his long-term stock and thus get long-term capital gains treatment on the premium, or he can buy stock at the new higher market price, deliver it, and get short-term capital loss treatment. If he has short-term gains to offset, there may be circumstances where the latter alternative is the preferable one. The holder of a put does not have this choice of strategies because of the stricter tax rulings.

There is still plenty of room for manuever, however. A couple of examples of tax uses of options can be given to show this use of them.

\textsuperscript{13}For example, see "Options and Taxes," the Godnick and Son publication.
Consider the following arbitrage operation. Suppose a trader sells a six-month call for $400 and at the same time buys a call in the same issue in a different transaction for $450, the $50 difference being the dealer's take. The two positions cancel out of course. Now suppose after six months the price of the stock has risen by ten points. Since the call that has been written is going to be exercised, stock is purchased at the higher price to fulfill the contract. The result of this transaction will be a $600 short-term loss ($1000-$400). After the six months the call option that is held is sold to a third party for its present value, which will be $1000. The result of the second transaction is a $550 long-term gain. Suppose the trader is in the 50% tax bracket and has some short-term gains which can be offset. The $600 short-term loss will reduce by $300 the tax bill that otherwise would be paid. The maximum tax on the new gain is the long-term rate of 25% or about $160. The result of the two operations is a net profit of $140 (commissions and taxes have been neglected). Suppose the price had fallen instead of risen by the ten points. The result would have been ordinary income of $400 and a short-term loss of $450. The result of the two transactions here would be an after-tax loss of $25. Thus from a position free of market risk, because of the different tax rates, a trader can hope to gain a profit.

As a second illustration of the possible use of options for tax purposes, consider the following. It has become common practice to make charitable gifts of securities in which there are large profits which might have been taken. This is a more efficient way of giving
tax-wise, for by making a gift of the securities themselves, the profits in the securities are never taken and are therefore not taxable. But the size of the contribution is the value of the securities, and this contribution is deductible from one's income for tax purposes. Thus if a stock were originally purchased at $25 and the price subsequently rose to $100, there is a $75 capital gain in the security. To sell the stock in order to make a charitable contribution would involve paying taxes on the gain. On the other hand, giving the stock itself as a donation involves giving $75 of taxable gain plus the original $25 investment. Is there not a way that the stock can be donated such that only the taxable $75 is given while the original investment is maintained? It turns out there is. Suppose that, contemplating the gift, the man sells a call on the stock which can be exercised at $75, and that the premium received is $25. Before the stock is called it is donated to a charitable organization, subject to the call. The premium which is received reduces the basis of the stock to zero, and since the stock is given away and never sold, the premium is tax free. The third party has purchased a call for $25 which he can immediately exercise and make a gain of $25. The charitable organization has a stock which will shortly be called from them for $75. The original owner of the stock has made a $75 contribution. There is some doubt as to the legality of this operation.

Still another use of the option might be to get long-term treatments on dividends. Since on a call the option price is marked down by the amounts of any dividends in the period between the purchase and exercise of the paper, by selling a long-term call on which there have
been dividend reductions, they in effect are being treated as long-term capital gains.

Tax considerations have had a strong impact upon the option market. Trading practices and institutions have been developed to facilitate favorable tax treatment. An example is the development of the practice of dealers buying back "second-hand" options for the purpose of establishing tax gains and losses for their customers. The dealers in their advertisements often stress the tax advantages. Thus one dealer asks in an advertisement, "Are you aware that the following situation is possible: lose $1000 for five years, gain $5000 the sixth year, and end up with a net gain of $1250 after taxes?" As security traders become more and more conscious of tax considerations, there will be more and more use of options. Without a doubt the flexibility of option trading plus the tax flexibility in this trading have already given option trading a strong boost.

\[11\] This is from a Godnick and Son ad which has appeared frequently in the New York Sunday Times. While I do not know the exact use of options to which Godnick is referring, I would suspect it is something like the following: Suppose the odds and outcomes from buying $1000 worth of calls are five times out of six the calls will be worthless, one time out of six they bring a gain of $5000. If six sets of purchases will conform to the averages, then with six-month calls it is possible to turn the losses into short-term ones and the gains into a long-term one. With differences in tax rates the profits can accrue, even though the expected gain (sans taxes) would be zero.
APPENDIX TO CHAPTER V

A Detailed Exposition of the Effect of Option Trading Upon Exchange Activity

This appendix treats all the various assumptions concerning the activity and comparative price expectations of the option participants as outlined in the preceding chapter. The results of this detailed exposition have also been summarized there.

Let us first consider the case where the option buyer and writer have the same expectations as to future prices. Suppose the buyer purchases a straddle on 400 shares of a stock. The writer sells the call, but also being bullish, buys the 400 shares to convert his to a put position. The initial impact on the stock market of this trade is the 400 share purchase. What would have happened had the traders dealt in stock? If the writer had gone into stocks, the plausibility of which we suggested above, he would have purchased 400 shares, if he were interested in the same stock. These, instead of being for conversion, would be for his own account. And if the buyer were as active in stocks as he was in options, he also would be purchasing 400 shares. If he were able only to deal in smaller quantities, his purchases would be less than this, say 100 shares. In either event the presence of the option trading tends to reduce the purchases in stock from those that would be made with no such trading. The initial impact is to make the market less active and to reduce the upward pressure on the price in question. So if the expectations upon which these activities were based become fulfilled, there would be less of a tendency for prices to be stabilized over time from the considerations of these initial impacts.
Let us carry the comparison a bit further. Suppose the price of the stock rises, as both men expect it to. The call will be exercised, of course. If the traders remain bullish, the buyer may now want to retain the 400 shares. The writer is now in cash, but will probably want to move into stock, and, let us say, he buys 400 shares of the stock. Under these circumstances we can assume that, had the men traded in stock and each purchased 400 shares initially, they would still be holding the stock for still further rises. What, then, has been the effect of the option trading? In this particular case the total purchase on the exchange would be the same—800 shares. Where the traders dealt in stock the purchases would have been made initially; with the option trading, half is made initially and half after a price rise has occurred. The upward pressure on the price, instead of coming in its entirety when the price is low, now comes half at the lower price and half at the higher price; the corrective pressures on price from the speculators' activities have been blunted to a degree. The total activity on the exchange over time is the same, but it is spread out with the option trading present.

If the buyer of the option would have purchased less in stock than he did in options, the conclusions would have to be modified somewhat. This kind of trader is much less likely to hold the 400 shares of stock for further price rises. If he bought the option in first place to spread a given amount of money over as many shares as

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15 The cash he has received is sufficient to buy 400 shares at the former price, but not at the new, higher price. It will be convenient to assume that with his premiums and other cash that he might have he will buy the 400 shares, however. This makes for round numbers and does not affect the discussion in any important way.
possible, then he would be unable to carry the 400 shares and would have to take his profits. If he is still bullish he may sell, say, 300 of the shares which he has called from the writer. If the writer is again going to use his cash to buy 400 shares there will be a net purchase of 100 shares on the exchange. In this case the initial upward pressure on prices was reduced by the elimination of a 100 share purchase, and at the later higher price this pressure occurs. Again the beneficial activities of the speculation are somewhat blunted, but to a lesser degree because the activity of the buyer would not have been as great in firm stock. The total number of exchange transactions has increased; instead of purchases of 500 shares in this period, there are now purchases of 800 shares and sales of 300 shares. Thus the market has been made more active.

Again, let us suppose that the expectations of the speculators have been fulfilled - the price has risen - but they no longer foresee future rises. They want to take their profits. The 400 shares stock will now be called and sold on the exchange. Had the men been dealing in stock only, there would have been sales at this time of 500 or 800 shares, depending upon the size of the buyers activities. The result of the option trading is a reduction in price pressure, the magnitude of it depending upon how active the buyer would have been. Also the total number of shares sold on the exchange is reduced. Thus if the traders who deal in options are interested in short-term movements and the taking of their profits and if they have similar (correct) expectations, the result is a less active market and weaker corrective price pressures.
One further possibility in this situation remains to be mentioned. The writer can be a person who, apart from his writing activity, is interested in holding a stock portfolio over the long run, while the buyer is a trader interested in short-run gains. Should the price rise here the stock will be called and sold on the exchange, but the writer will also be purchasing the same amount (see the previous footnote). Had the men dealt in stocks the buyer would be selling the stock he had purchased, either 400 or 100 shares, and the writer would be holding on to his. This the result of the option trading is to either nullify or reverse the pressure that would have been exerted at this time by the buyer's sales. The total number shares traded on the exchange would be the same in both cases if the buyer would have been dealing in 100 shares of stock, otherwise the presence of the option trading would tend to increase this number.

These would have been the results had the expectations of the traders been fulfilled. Now let us suppose they had not been fulfilled and that prices did not rise. In this event speculation in stocks, as was pointed out earlier, will not tend to stabilize prices. In the case of option dealing the contract will not be exercised; the writer will be holding 400 shares of stock. If he is still bullish or if he is interested in holding stocks over the long run, he may want to keep the stock, in which case he makes no exchange transactions, nor would he have, had he dealt only in stock. If the short term failure of the price to rise would not have dampened the bullishness of the buyer, he also might be still holding any stock he had purchased. In this event the presence of the option trading makes no change in
the stock-exchange activity. If either of the traders had become discouraged with the price behavior, they would have sold stock they had purchased, putting downward pressure on the lower price. The fact that the buyer purchased a call prevents him from doing this, but the writer still can, of course. If prices go against the expectations of the two, the adverse pressure that could result might be modified by option trading, and the market is made less active.

All this preceding discussion has assumed that the two traders had the same expectations at the outset of the trade - they were either both bullish or bearish. Now we must consider the case where the men have opposite expectations, one bullish while the other is bearish, or vice versa. Assume the buyer is bearish and purchases a 400-share put; the writer, expecting prices to rise, is willing to write the put and he will not convert it. Thus there is no exchange purchase or sale at the outset of the option trade. What would the exchange transactions have been in the absence of the option trading? The option writer would have been purchasing the 400 shares, we can assume. To profit from his bearishness the buyer would have sold either the 400 shares or a smaller amount, again let us say 100 shares. In the first instance the price pressures would have cancelled, but if the buyer would have been dealing in smaller amounts in stocks, the buying pressure on the exchange stemming from the writer's stock purchases would have been greater than the sales of the buyer. Thus the initial impact of the option transaction is to reduce the amount of exchange dealing and to alter the pressure of prices if the two
traders would have been dealing in stock in differing quantities in the absence of the option trading. In our case the writer's pressure may tend to be reduced by option trading.

Suppose now that the price advances and that the writer's expectations are fulfilled. The put will not be exercised. The writer now is in cash free of any option obligations, and assuming he continues to be bullish may go into stock, purchasing, let us say, the 400 shares. On this assumption, the exchange transactions at the end of the option period amount to the 400 share purchase by the writer at the higher price. What would have happened had there not been the option trade? If the buyer would have closed out his sale there would have been purchases of 400 or 100 shares from him. If he remained bearish, perhaps he would have maintained the same position. If the writer wanted to take his profits he would be selling 400 shares. Thus if the expectations remain unchanged, there would be no exchange purchase or sale; the presence of the option trade would then distort the buying pressure over time— the writer's purchase now occurs at a higher price. The tendency towards a less active market is somewhat offset by this delayed purchase. If the expectations were such that both traders wanted to close his position (in which case the writer would stay in cash after the option transaction), there would have been sales on the exchange of 400 shares and purchases of either 100 or 400 shares. This case is symmetrical with the one previously discussed; the option trading tends to reduce the number of market transactions and the possibly greater price pressure which would have stemmed from the writer (with his correct expectations) would be offset. If the
buyer would have closed out his short position while the writer was maintaining his long position, purchases of 400 or 100 shares would have occurred on the exchange. The option trading would then either duplicate what would have otherwise happened (but for different reasons, of course) or it would mean a bit of an increase in the exchange purchases.

Still maintaining the opposite expectations, let us examine the cases where the buyer's expectations are fulfilled, or, in our example, where the price falls. The put option will be exercised and the writer must accept 400 shares from the buyer. The buyer will purchase the 400 shares at the lower price on the exchange for the delivery. The writer most likely will hold the 400 shares, but there is the possibility of his selling them if his expectations have changed. What would have happened if there had not been the option dealing? With the price now down the buyer may have closed out his short account by purchasing the stock or he may have maintained that account, expecting prices to fall further. The writer most likely would have held the 400 shares, but again, there is the possibility of his selling them if the adverse price movement has changed his expectations about future price movements. Thus if expectations remained unchanged, the presence of the option trading might tend to close out the short interest before it would have been closed out, thus increasing the exchange trading at that time from that which would have existed. Thus the tendency toward thinness is somewhat offset. Upward pressure on the price would be exerted after the fall. If both men would have closed out their positions, there would have
been sales of 400 shares and purchases of either 400 or 100 shares on
the exchange. Here the option trading tends to reduce the thickness
of the market, but it eliminates the possibility of the writer's
activities (which are based on incorrect expectations here) putting
a downward pressure on the already lower price. If the writer would
have stayed in stocks despite the price fall while the buyer was
closing his account, the option trading would increase both the size
of market transactions and the corrective pressure on prices if the
option buyer would have dealt in stocks in smaller quantity than he
dealt in options.

We have now examined the series of cases which arise from the
traders holding the same expectations and from their holding opposite
expectations. The additional possibility we shall discuss is that of
the writer holding neutral expectations while the buyer is either
bullish or bearish. By these neutral expectations we mean that the
writer will convert any option that he sells into a straddle and that
the funds used in writing these straddles would not have been in
stock in the absence of the option trading. Suppose the buyer pur-
chases a call on 400 shares of a stock; the writer sells the call
and buys 200 shares to convert his to a straddle position. The
impact on the exchange from entering into the option bargain is this
200-share purchase. In the absence of the option deal, the writer would
not be dealing in stock, the buyer would be purchasing either 400 or
100 shares. The initial impact thus may either increase or decrease
the size of the exchange transactions and the pressure on price in
the direction of the buyer's expectations. Whether it is an increase
or decrease depends upon how large the buyer's activities would be in firm stock. Suppose the price advances. The call will be exercised. The writer will then enter the market for 200 more shares. The buyer may hold the stock if he expects further increases, he may sell to take his profit, or he may sell some and hold the rest. Thus if the buyer would have been dealing in 400 shares of firm stock and would have held it for further price increases, the presence of the option trading does not alter the total number of market transactions over time, but it does partially delay the upward impact on prices until the price has already advanced somewhat. If the buyer would have been operating on a reduced scale in stock and would have held some of the stock he did call from the writer for further price increases, the option trading would (in the 100 share case) increase the initial amount of stock purchases and thus the pressure on price, but at the time of option termination there would have been a net 100 share sale which would not otherwise have existed, and the number of transactions would have been substantially increased, thus thickening the market. If the buyer would completely take his profits, he would sell the 400 shares. The option trading serves to both thicken the market and increase the (in this case correct) price pressures if the buyer would have been dealing in less than 200 shares of stock; had he been dealing in more than 200 shares, the option trading would

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16 If the buyer would have been dealing in 200 shares of stock rather than the hypothesized 100 shares, the option dealing would have served to increase the volume of transactions, but not to alter the price pressure. If his dealing would have been greater than 200 shares, the qualitative results of the 400 share case discussed above follow, but quantitatively they would not be as large, of course.
tend to thicken the market but decrease the price pressure. If he would have dealt in 400 shares, the volume of transactions on the exchange would be unchanged, but the price pressure would be smoothed out over time, some of the upward pressure coming after the price had already risen.

If the buyer's expectations were wrong and in our example the price fell, different results will hold. The call will not be exercised, and the writer will cancel out his position by selling his 200 shares. Price-pressure-wise, the writer's temporary entry into the market has been destabilizing - he has purchased at a higher price than the one at which he sold. Had the buyer dealt in stocks, he would have initially purchased 400 or fewer shares. With the adverse price movement he may have closed out his account at a loss or held for the expected rise. The presence of the option trading, in addition to the adverse affect on the stability of price, would also have created a thinner market than would have prevailed if the buyer would have dealt in more than 200 shares and taken his loss after the price had fallen. In other cases the writer's activities would have created a thicker market.
CHAPTER VI
PREMIUMS AND STOCK PRICES; OPTION PROFITABILITY

Option premiums, stock market prices and their variability.

There are many factors that affect option premiums: the price of the stock on which the option is written, the variability of that price, the length of the option contract, the amount of activity in the issue both in the stock and option markets, etc. All these, and many more, factors affect the supply and demand of options. Premiums vary from time to time, as well as from stock issue to stock issue. An indication of typical option prices is presented in Table I where the premiums are listed for 90-day puts and calls and six-month puts and calls that were quoted during the week ending June 17, 1955.

The strongest factor affecting option premiums is the market price of the stock upon which the option is drawn. There are many reasons why this is so. Many costs are directly related to the stock price. To the writer the margin that will be required of him is directly proportional to the price of the stock, as is the margin required of the buyer when he takes any possible profits or holds the stock. The cost of option conversion is directly dependent upon the price of the stock. The costs of alternative methods of stock speculation are also dependent upon the price of the stock. Most important, the absolute amount by which stock prices vary is correlated with the prices themselves. So stock prices are an important factor for option premiums for many reasons.

Also of obvious importance is the volatility of stock prices. Options are purchased and only have value because stock prices are
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<th>Range, 1955</th>
<th>Put Premiums</th>
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Sources: SEC, Barron’s.
expected to change, and because they have a history of fluctuation. Stocks have varying volatilities. An issue such as Consolidated Edison experiences smaller price fluctuations than others which sell for approximately the same market price, such as General Motors or Lockheed Aircraft. The more volatile the stock, the higher the option premium on that stock.

Knowing stock prices and volatility, how well can option premiums be estimated? How closely are option premiums correlated with stock prices and measures of volatility? An attempt has been made to answer these questions.

Nominal option premium quotations, available from the SEC, were examined for a thirteen week period (a sample of such quotations was presented in Table I). These are not premiums corresponding to actual transactions, rather they are "representative" prices submitted to the SEC by the option dealer Association secretary.¹ Of the forty-odd issues for which these premiums were available those which averaged two or less option sales per week were eliminated from further study on the grounds that the activity in them was too small for the premiums to reflect typical market forces. After these were eliminated there remained 3½ issues for each of the thirteen weeks for which representative prices were available.

¹The premiums listed are a little higher than what actual market premiums are likely to be. This is because they are also sent into the Wall Street Journal which occasionally lists them as offerings of a "dealer." They get published, however, approximately five days after they are drawn up, therefore a little "give" is inserted into the listings to protect the dealer against price changes which may occur in the interim.
The stock market prices with which these premiums were compared were the midpoints between the high and low prices for the week in question. As a measure of volatility the range of the stock during the year to date was used. Other measures which were considered were the Value Line Investment Survey volatility indices and the American Investors Service volatility ranking. With respect to the first, the Survey does not explain how the indices are computed. Preliminary experimentation with them suggested that prices movements over the very long run are predominant, and it was felt that this was not the kind of volatility relevant to the short-term periods with which option trading is concerned. The American Investors Service ratings, on the other hand, are qualitative; all the issues which they rate are given a ranking of A, B, C, D, or E. The classifications seemed too broad for present purposes, most stocks for which option premiums were available were in the same group (given the C rating). Using the range of stock-market prices has both advantages and shortcomings. The data are easily come by, a virtue not to be taken lightly. Furthermore, a measure of the absolute number of points that a price moves is relevant for option premiums, the possible profits to be made from an option depending directly on the absolute price movement. One shortcoming of using the range is that it is highly correlated with the stock price itself, and thus the amount of new information provided is somewhat limited. A second shortcoming is that the range only gives information as to the boundaries in which the price has moved; it does not indicate how much movement has taken place within these boundaries.
This "inner" movement is relevant for option trading. The measure of volatility used is subject to these limitations.

Option premiums vary with the duration of the option. To eliminate this time effect on the size of the premiums only ninety-day call premiums were examined. The other premiums were not considered.

Data were collected for thirteen weeks - the weeks ending October 15, 22 and 29, and November 5 and 12, 1954; January 7, 14, 21, and 28, 1955; and June 10, 17, 24 and July 1, 1955. The periods for which the ranges of the stocks were taken were those listed in the financial journals at the time. Thus for the November, 1954 period they are the ranges for the previous ten months, approximately. For the January, 1955 period, the period is for the previous twelve months, and for the June, 1955, period for the previous six months. Because these measures of volatility cover the periods substantially different in length, all thirteen weeks were not lumped together into one group. Three separate groups were examined for the relationship between the option premiums and stock prices and volatility: the "November" period of 1954, the January and June periods of 1955. The results of the application of multiple correlation analysis to the three groups of data are presented in Table II, where X represents

---

2 Even within these smaller groups there is some variation in this period over which the volatility is being measured. Thus the range for the week ending October 15 is that for the previous nine and one-half months; the range for the week ending November 12 is that for the previous ten and one-half months. It is not felt that this discrepancy will affect in any significant way the results of the correlation analysis.
90-day call option premiums, Y stock prices, and Z the range of these prices.³

The coefficients of multiple correlation \( R_{x,yz} \) are uniformly high for the three periods, ranging from .943 for the January period to .984 for the June period. The square of this measure represents the proportion of the variance in option premiums which has been accounted for by stock prices and their range.⁴ Thus in the November period 93% of the variation is accounted for, 89% in the January period, and 97% in the June period. The standard error of estimate is also of interest, for it is a measure of how accurately one might expect to be able to estimate option premiums. This varies in magnitude from 36.52 for the June period to 37.38 for the November period, going up to 75.49 for the January period, a sizable increase (all in terms of dollars). The correlation fits best for the June period, worst for the January period.

This divergent performance is of significance. One reason the January showing is poorer is that all three of the variables have more "original" variance in this period than in the others. But of

---

³Customary terminology is used: \( r_{xy} \) is the simple correlation coefficient between the variables X and Y, \( r_{xy.z} \) is the partial correlation coefficient between X and Y, the effect of Z being held constant. \( s_x \) is the standard deviation of variable X; \( s_{x,yz} \) is the standard error of estimate. \( R_{x,yz} \) is the multiple correlation coefficient. The constants a, b, and c of the regression plane are those found by solution of the normal equations, where it is assured that the structural relationships among the variables is of the form \( X = a + bY + cZ \).

### TABLE II

Results of Correlation Analysis between Option Premiums, Stock Prices and Ranges of Stock Prices.

<table>
<thead>
<tr>
<th></th>
<th>November Period</th>
<th>January Period</th>
<th>June Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \bar{X} )</td>
<td>342.43</td>
<td>483.09</td>
<td>451.65</td>
</tr>
<tr>
<td>( Y )</td>
<td>48.49</td>
<td>57.92</td>
<td>54.68</td>
</tr>
<tr>
<td>( Z )</td>
<td>17.37</td>
<td>26.85</td>
<td>14.67</td>
</tr>
<tr>
<td>( S_x )</td>
<td>142.07</td>
<td>226.97</td>
<td>206.45</td>
</tr>
<tr>
<td>( S_y )</td>
<td>25.31</td>
<td>30.07</td>
<td>28.23</td>
</tr>
<tr>
<td>( S_z )</td>
<td>9.51</td>
<td>16.01</td>
<td>9.57</td>
</tr>
<tr>
<td>( r_{xy} )</td>
<td>0.9566</td>
<td>0.9338</td>
<td>0.9631</td>
</tr>
<tr>
<td>( r_{xz} )</td>
<td>0.8948</td>
<td>0.9128</td>
<td>0.7856</td>
</tr>
<tr>
<td>( r_{yz} )</td>
<td>0.8708</td>
<td>0.9227</td>
<td>0.6569</td>
</tr>
<tr>
<td>( r_{xy,z} )</td>
<td>0.8082</td>
<td>0.5820</td>
<td>0.9580</td>
</tr>
<tr>
<td>( r_{xz,y} )</td>
<td>0.4328</td>
<td>0.3713</td>
<td>0.7536</td>
</tr>
<tr>
<td>( S_{x,yz} )</td>
<td>37.38</td>
<td>75.49</td>
<td>36.52</td>
</tr>
<tr>
<td>( R_{x,yz} )</td>
<td>0.965</td>
<td>0.943</td>
<td>0.9816</td>
</tr>
<tr>
<td>( a )</td>
<td>76.1</td>
<td>82.7</td>
<td>52.1</td>
</tr>
<tr>
<td>( b )</td>
<td>4.08</td>
<td>4.66</td>
<td>5.75</td>
</tr>
<tr>
<td>( S_b )</td>
<td>0.23</td>
<td>0.56</td>
<td>0.15</td>
</tr>
<tr>
<td>( c )</td>
<td>3.93</td>
<td>4.86</td>
<td>5.81</td>
</tr>
<tr>
<td>( S_c )</td>
<td>0.61</td>
<td>1.05</td>
<td>0.43</td>
</tr>
<tr>
<td>( n )</td>
<td>170</td>
<td>136</td>
<td>136</td>
</tr>
</tbody>
</table>
more importance is the manner in which the variables are correlated in the three periods. Again the simple correlation coefficients are uniformly high among all three variables in each of the three periods. In each period the correlation between option premiums and stock prices is the highest among the variables. In the June period, the period of best "fit," the simple correlation coefficient between premiums and stock prices is highest, while the correlation between premiums and range, and range and stock prices is lowest. In the January period, the period of worst fit, the correlation between premiums and prices is lowest, while the correlation between premiums and range, and range and prices is highest. These relationships are reflected in the partial correlation coefficients. Throughout, the partial correlation coefficients between premiums and prices are higher than those between premiums and ranges. The partial correlation coefficients are highest for the June period when the simple correlation between premiums and prices is the highest and the simple coefficient between prices and ranges is lowest; this lower correlation between ranges and prices means that the range data provides more independent information with which the variations in premiums may be explained. Similarly, when the correlation between stock prices and ranges is highest, less independent information is to be found in the range data, and the partial coefficient between premiums and ranges is low, as in the January period.

The experience of these three periods suggests that the longer the period which the range of stock prices covers, the more closely correlated are the ranges to stock prices. For the purposes to which
they are being put in this analysis, this tends to limit the usefulness of the range data. When both prices and ranges are being compared to option premiums, range data covering five or six months would seem to be preferable to that covering longer periods.

The estimating equations for the three periods are

\[ X = 76.1 + 4.08 Y + 3.93 Z \] (November)
\[ X = 82.7 + 4.66 Y + 4.86 Z \] (January)
\[ X = 52.1 + 5.75 Y + 5.81 Z \] (June)

The standard deviations of the slopes of the regression planes are larger for the Z coefficients than for the Y coefficients, and they are largest for the January period, smallest for the June period, as is to be expected from the magnitude of the other variables we have discussed. The varying length of the period over which the range is measured does not seem to have a uniform effect upon the constants in these equations. The slope-coefficients are highest for the June period when the range covers only six months, they are lowest for the November period when the range covers a ten months’ period, but they increase again for the January period.

The results of the above analysis clearly seems to be that variations among option premiums is closely correlated with stock prices and the ranges of these prices. For each of the periods examined the least-squares regression equation has been determined which best "fits" the data. The question naturally arises as to whether these regression equations might be useful in estimating what option premiums might be in other, similar periods. The least-squares equations may fit well in the periods under examination without fitting similar periods at all well.
To examine how well the regression equations used for the above periods work in other periods, data from 1946 and 1948 were examined. Option premiums for thirteen stocks listed with the SEC were compared with "estimated" premiums for these same stocks computed by inserting the appropriate data into our regression equations. The dates of the premiums used were such as to fall into our "periods." The results of the comparisons are listed in Tables III to VIII.

On the whole the attempts at transplanting the regression equations to different periods were not very successful. Table III contains the comparison for premiums listed on January 4, 1946, and the estimate based upon stock prices and ranges existing at that time. Four of the estimated premiums deviate from the actual premiums by more than 10%. The average deviation is about $11. Another measure of how good the estimates are is provided by a look at the variances of the deviations and of the actual premiums. The variance of the deviations is substantially lower than that of the premiums. A measure analogous to the coefficient of multiple correlation, call it r, can be derived from these variances by setting

\[ r = 1 - \frac{\text{variance of deviations}}{\text{variance of actual premiums}} \]

For these January 4, 1946 data, \( r = .5842 \). On the whole, the estimates

---

5The largest deviation is $312 from the actual premium of $850 for American Tel. and Tel. As will become evident, this stock is one for which prediction by these methods is not good. This high-priced stock, does not move much in price, and therefore option premiums on it are significantly lower than on similar high-priced issues. American Tel. and Tel. is not a volume leader in options, and it may be somewhat misleading to quote premiums on it, for its premium is not indicative of the usual.
<table>
<thead>
<tr>
<th>Stock</th>
<th>Actual Premium</th>
<th>Estimated Premium</th>
<th>Deviation</th>
<th>Deviation as Per Cent of Actual Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tel. and Tel.</td>
<td>$850.00</td>
<td>$1162</td>
<td>$312</td>
<td>37</td>
</tr>
<tr>
<td>Anaconda</td>
<td>500.00</td>
<td>385</td>
<td>-115</td>
<td>23</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>700.00</td>
<td>686</td>
<td>-14</td>
<td>2</td>
</tr>
<tr>
<td>Chrysler</td>
<td>900.00</td>
<td>936</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>General Motors</td>
<td>500.00</td>
<td>511</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Kennecott Copper</td>
<td>362.50</td>
<td>389</td>
<td>26</td>
<td>7</td>
</tr>
<tr>
<td>Loews</td>
<td>325.00</td>
<td>299</td>
<td>-26</td>
<td>8</td>
</tr>
<tr>
<td>Montgomery Ward</td>
<td>425.00</td>
<td>559</td>
<td>134</td>
<td>32</td>
</tr>
<tr>
<td>New York Central</td>
<td>375.00</td>
<td>305</td>
<td>-70</td>
<td>19</td>
</tr>
<tr>
<td>Republic Steel</td>
<td>350.00</td>
<td>291</td>
<td>-59</td>
<td>17</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>525.00</td>
<td>470</td>
<td>-55</td>
<td>10</td>
</tr>
<tr>
<td>U.S. Rubber</td>
<td>550.00</td>
<td>498</td>
<td>-52</td>
<td>9</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>575.00</td>
<td>587</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

Variance of Actual Premiums = 31,537

Variance of Deviations = 13,112

\[ r = 1 - \frac{13,112}{31,537} = .5842 \]
### TABLE IV

**Actual and Estimated 90-day Call Premiums,**

**Thirteen Stocks, July 5, 1946**

<table>
<thead>
<tr>
<th>Stock</th>
<th>Actual Premium</th>
<th>Estimated Premium</th>
<th>Deviation</th>
<th>Deviation as Per Cent of Actual Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tel. and Tel.</td>
<td>$800.00</td>
<td>$1277</td>
<td>$477</td>
<td>60</td>
</tr>
<tr>
<td>Anaconda</td>
<td>375.00</td>
<td>380</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>850.00</td>
<td>812</td>
<td>-38</td>
<td>4</td>
</tr>
<tr>
<td>Chrysler</td>
<td>1150.00</td>
<td>933</td>
<td>-217</td>
<td>19</td>
</tr>
<tr>
<td>General Motors</td>
<td>525.00</td>
<td>524</td>
<td>-1</td>
<td>-</td>
</tr>
<tr>
<td>Kenecott Copper</td>
<td>1400.00</td>
<td>1456</td>
<td>56</td>
<td>14</td>
</tr>
<tr>
<td>Loews</td>
<td>300.00</td>
<td>305</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Montgomery Ward</td>
<td>550.00</td>
<td>773</td>
<td>223</td>
<td>41</td>
</tr>
<tr>
<td>New York Central</td>
<td>287.50</td>
<td>266</td>
<td>-22</td>
<td>8</td>
</tr>
<tr>
<td>Republic Steel</td>
<td>325.00</td>
<td>340</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>550.00</td>
<td>530</td>
<td>-20</td>
<td>4</td>
</tr>
<tr>
<td>U.S. Rubber</td>
<td>700.00</td>
<td>517</td>
<td>-153</td>
<td>21</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>625.00</td>
<td>686</td>
<td>61</td>
<td>10</td>
</tr>
</tbody>
</table>

Variance of Actual Premiums = 63,916

Variance of Deviations = 31,405

\[
r = 1 - \frac{31,405}{63,916} = .5087
\]
### TABLE V

**Actual and Estimated 90-day Call Premiums.**

**Thirteen Stocks, October 4, 1946**

<table>
<thead>
<tr>
<th>Stock</th>
<th>Actual Premium</th>
<th>Estimated Premium</th>
<th>Deviation</th>
<th>Deviation as Per Cent of Actual Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tel. and Tel.</td>
<td>$1100</td>
<td>$904</td>
<td>$-196</td>
<td>18</td>
</tr>
<tr>
<td>Anaconda</td>
<td>450</td>
<td>298</td>
<td>-152</td>
<td>34</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>900</td>
<td>578</td>
<td>-322</td>
<td>36</td>
</tr>
<tr>
<td>Chrysler</td>
<td>1200</td>
<td>671</td>
<td>-529</td>
<td>44</td>
</tr>
<tr>
<td>General Motors</td>
<td>600</td>
<td>406</td>
<td>-194</td>
<td>32</td>
</tr>
<tr>
<td>Kennecott Copper</td>
<td>450</td>
<td>339</td>
<td>-111</td>
<td>25</td>
</tr>
<tr>
<td>Loews</td>
<td>350</td>
<td>211</td>
<td>-109</td>
<td>31</td>
</tr>
<tr>
<td>Montgomery Ward</td>
<td>650</td>
<td>510</td>
<td>-131</td>
<td>20</td>
</tr>
<tr>
<td>New York Central</td>
<td>275</td>
<td>224</td>
<td>-51</td>
<td>19</td>
</tr>
<tr>
<td>Republic Steel</td>
<td>350</td>
<td>219</td>
<td>-101</td>
<td>29</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>575</td>
<td>369</td>
<td>-206</td>
<td>36</td>
</tr>
<tr>
<td>U.S. Rubber</td>
<td>700</td>
<td>427</td>
<td>-273</td>
<td>39</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>700</td>
<td>480</td>
<td>-220</td>
<td>31</td>
</tr>
</tbody>
</table>

Variance of Actual Premiums = 75,348

Variance of Deviations = 11,946

$$r = 1 - \frac{11,946}{75,348} = .8016$$
<table>
<thead>
<tr>
<th>Stock</th>
<th>Actual Premium</th>
<th>Estimated Premium</th>
<th>Deviation</th>
<th>Deviation as Per Cent of Actual Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tel. and Tel.</td>
<td>$275.00</td>
<td>$909</td>
<td>$634</td>
<td>230</td>
</tr>
<tr>
<td>Anaconda</td>
<td>225.00</td>
<td>294</td>
<td>69</td>
<td>31</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>550.00</td>
<td>704</td>
<td>154</td>
<td>28</td>
</tr>
<tr>
<td>Chrysler</td>
<td>425.00</td>
<td>494</td>
<td>69</td>
<td>16</td>
</tr>
<tr>
<td>General Motors</td>
<td>300.00</td>
<td>417</td>
<td>117</td>
<td>39</td>
</tr>
<tr>
<td>Kenecott Copper</td>
<td>350.00</td>
<td>360.</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Loews</td>
<td>175.00</td>
<td>211</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>Montgomery Ward</td>
<td>325.00</td>
<td>408</td>
<td>83</td>
<td>26</td>
</tr>
<tr>
<td>New York Central</td>
<td>162.50</td>
<td>202</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>Republic Steel</td>
<td>225.00</td>
<td>248</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>325.00</td>
<td>394</td>
<td>69</td>
<td>21</td>
</tr>
<tr>
<td>U.S. Rubber</td>
<td>325.00</td>
<td>390</td>
<td>65</td>
<td>20</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>412.50</td>
<td>533</td>
<td>121</td>
<td>29</td>
</tr>
</tbody>
</table>

Variance of Actual Premiums = 10,713

Variance of Deviations = 28,377

\[ r = -1.00 \]
### TABLE VII

**Actual and Estimated 90-day Call Premiums,**

**Thirteen Stocks, July 2, 1948**

<table>
<thead>
<tr>
<th>Stock</th>
<th>Actual Premium</th>
<th>Estimated Premium</th>
<th>Deviation</th>
<th>Deviation as Per Cent of Actual Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tel. and Tel.</td>
<td>$175.00</td>
<td>$1007</td>
<td>$832</td>
<td>475</td>
</tr>
<tr>
<td>Anaconda</td>
<td>250.00</td>
<td>340</td>
<td>90</td>
<td>36</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>237.50</td>
<td>305</td>
<td>67</td>
<td>28</td>
</tr>
<tr>
<td>Chrysler</td>
<td>350.00</td>
<td>496</td>
<td>146</td>
<td>42</td>
</tr>
<tr>
<td>General Motors</td>
<td>300.00</td>
<td>507</td>
<td>207</td>
<td>69</td>
</tr>
<tr>
<td>Kennecott Copper</td>
<td>350.00</td>
<td>491</td>
<td>141</td>
<td>40</td>
</tr>
<tr>
<td>Loews</td>
<td>150.00</td>
<td>185</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Montgomery Ward</td>
<td>325.00</td>
<td>502</td>
<td>177</td>
<td>55</td>
</tr>
<tr>
<td>New York Central</td>
<td>150.00</td>
<td>185</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Republic Steel</td>
<td>200.00</td>
<td>283</td>
<td>83</td>
<td>42</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>350.00</td>
<td>490</td>
<td>140</td>
<td>40</td>
</tr>
<tr>
<td>U.S. Rubber</td>
<td>250.00</td>
<td>392</td>
<td>142</td>
<td>57</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>400.00</td>
<td>605</td>
<td>205</td>
<td>51</td>
</tr>
</tbody>
</table>

Variance of Actual Premiums = 6,503

Variance of Deviations = 48,702

\[ r = -1.00 \]
TABLE VIII

Actual and Estimated 90-day Call Premiums,
Thirteen Stocks, October 1, 1948

<table>
<thead>
<tr>
<th>Stock</th>
<th>Actual Premium</th>
<th>Estimated Premium</th>
<th>Deviation</th>
<th>Deviation as Per Cent of Actual Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tel. and Tel.</td>
<td>$175.00</td>
<td>$833</td>
<td>$658</td>
<td>376</td>
</tr>
<tr>
<td>Anaconda</td>
<td>250.00</td>
<td>262</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>262.50</td>
<td>250</td>
<td>-12</td>
<td>5</td>
</tr>
<tr>
<td>Chrysler</td>
<td>375.00</td>
<td>355</td>
<td>-20</td>
<td>5</td>
</tr>
<tr>
<td>General Motors</td>
<td>325.00</td>
<td>381</td>
<td>56</td>
<td>17</td>
</tr>
<tr>
<td>Ke-scott Copper</td>
<td>350.00</td>
<td>375</td>
<td>25</td>
<td>7</td>
</tr>
<tr>
<td>Loews</td>
<td>150.00</td>
<td>157</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Montgomery Ward</td>
<td>300.00</td>
<td>367</td>
<td>67</td>
<td>22</td>
</tr>
<tr>
<td>New York Central</td>
<td>150.00</td>
<td>161</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Republic Steel</td>
<td>225.00</td>
<td>233</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Southern Pacific</td>
<td>375.00</td>
<td>384</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>U.S. Rubber</td>
<td>312.50</td>
<td>299</td>
<td>-13</td>
<td>4</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>400.00</td>
<td>465</td>
<td>65</td>
<td>16</td>
</tr>
</tbody>
</table>

Variance of Actual Premiums = 6,913

Variance of Deviations = 35,275

r = -1.00
for these premiums do not work out too badly.  

Table IV presents the results from the estimates made for July 5, 1946 premiums. This time in five cases the deviations amount to more than 10%. Again AT and T is very bad. The average deviation is $30. The correlation index equals .5087, for the variance of the residuals is about half that of the actual premiums. The estimates are not as good as those of January 4, but they are not completely unsatisfactory.

The results presented in Table V for the estimates for October 4, 1946, are unsatisfactory. Every estimate is under the actual premium by 18% or more. The smallest deviation is $51, the average deviation is about $200. Oddly enough, the correlation index is high; it equals .8016, for the variance of the deviations is about one-fifth that of the premiums. These estimates are unsatisfactory, therefore, not because the variance of the residuals is high, but because the level of the estimates is uniformly too low. That the level of actual

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6These methods of appraising the results of the estimation are non-probabilistic, heuristic, and somewhat intuitive. Formal tests of the results from transplanting cross-sectional regression equations to different time periods do not exist as far as I am aware. A discussion of some of the problems involved can be found in E. Kuh, "Cross-sections, Time Series and the Specifications of Variables" (an unpublished manuscript). Despite the lack of such formal tests, it will be clear that some of the estimates are very bad, while others, such as the above, are much better.

7One shortcoming of our index of correlation is just this. An alternative method would be to take the variance around zero, the mean of the residuals in the original population. This variance would be very high, of course, and this would point up the unsatisfactory results. That the variance of the residuals is low but that the level of them is unsatisfactory suggests that a parallel shift in the regression equation would fit these new data.
premiums is high is undoubtedly a consequence of the somewhat renowned "Labor Day" market break of the preceding month and the uncertainty which resulted therefrom.

Switching now to 1948, the estimates for January 2 and July 2, as presented in Tables VI and VII, are unsatisfactory. In both instances the estimates are uniformly too high. For January 2, the percentage deviations range from 3% to 30% of actual option prices. The variance of the residuals exceeds those of actual premiums; estimating by use of the regression equation is of no help. For July 2, the estimates are worse than this. The percentage deviations vary from 23% to 475% of actual premiums, and again the variance of the deviations exceeds that of the actual premiums.

The estimates for October 1, 1948 are of interest; they are presented in Table VIII. All but four of the deviations are less than 10% of the actual premiums, but one deviation is 376% of the premium. The estimated premium for AT and T is $658 above the actual. Because of the one very bad estimate the variance of the deviations exceeds that of the actual premiums. If the AT and T estimate be excluded, however, the estimates here are not too bad. The largest one then is $67 and the average is $18. The variance of the residuals then falls to about 60% of the variance of the actual premiums, and $\sigma = .4053.$

8 The $175 for AT and T is unbelievably low. Inasmuch as the company was paying a quarterly dividend of $2.25, the buyer could expect to make $50 on a 90-day call if the market price did not move, for upon going ex-dividend, the option price would be reduced by the $2.25. Since activity in options in AT and T is very slow, the premium was probably a nominal one, and if actual transactions occurred, they probably took place at a higher premium.
Summing up, in two cases the results of the estimates are somewhat satisfactory, as they are in a third if one stock with especially bad estimates for premiums be neglected. In the other three cases the estimated premiums are unsatisfactory as approximations to actual premiums. The conclusion is reached that using regression equations from one period to estimate premiums in another is not reliable when premiums are related to stock prices and ranges. Perhaps the inclusion of more or other independent variables would improve the reliability. While the correlation analysis does not provide us with reliable estimating equations, it does point out the very close correlation of premiums with stock prices and their ranges, particularly the prices.

The profitability of options. Are option prices too high? Do option buyers lose on the average on their option purchases? How profitable is option writing? The detailed data collected for the thirteen weeks previously mentioned permit the calculation of the profitability of option purchases in these periods, which calculations will provide some clues to the answers to the above queries.

To ascertain the profitability of the purchasing of the options the following was done: Rather than work out the profitability of all options for which data was available, I examined the eight leading issues. These eight issues account for 21% of all option sales in the periods studied. As has been previously noted, the premiums listed at the SEC are a "little" high; to adjust for this, all listed premiums

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9 These are not necessarily the eight option issues with the largest volume; they are the eight largest of the issues for which premiums are available.
of $1.00 or less were reduced by $12.50, while all premiums over
$4.00 were reduced by $25. The option volume data which is available
on individual issues is categorized according to the type (put or
call) and length of option: 30-day papers, 60-90-day papers, and longer
than 90-day papers. In working out the profitabilities of the pur-
chases, all 30-day options were neglected; they are few in number.
It was assumed that all 60-90-day papers were in fact 90-day options
and that all papers longer than 90 days were in fact six month
options. Further it was assumed that all options written during a
week were written at one price and that all sales or purchases of
stock made during the same week were made at the same price. The
price used was the mid-point between the high and low for the week.
The final assumption made was that all option purchasers held the
options until the paper expired, at which time they took their profits
if there were such.

With this preparation, the profits (and losses) that ensued from
the actual option purchases made during the thirteen weeks under
review were computed. The total initial costs were first computed.
They consist of the total paid for premiums plus the stamp taxes
paid on all calls purchased. The "gross returns" were then computed.
These consist of the differences between the price at the end of the
option period and the option price (reduced by the amount of any
"ex-dividends") multiplied by the number of shares of stock against
which the options that turned out favorably were written. (When the
gross return was not sufficient to cover commission costs in taking
the profits, it was neglected.) Then the costs of exercising the
options and taking the profits were computed. These consist of brokerage commissions and additional taxes arising from dealings in stock. The interest costs which would be involved in supplying minimum margins for the clearing period while the profits were being taken were neglected. The results of these computations are presented in Table IX.

The option purchases in the thirteen weeks under study were, on the whole, profitable. On an initial outlay of about $1,194,000, the buyers gained a net profit of about $921,000, a return of 77%. The profitability was not uniform among the stocks; both the total profit and the rate of profitability varied greatly. Two issues, New York Central and U.S. Steel, accounted for two-thirds of the total profits from the eight issues, while these two plus Western Union and Baltimore and Ohio accounted for all the profits; the net result from the other four issues was a net loss. The gains from the four most profitable issues were sufficient, however, to give the total results substantial profitability.

The question immediately raised is whether the results of these periods typify most option trading. A substantial rise in stock-market prices followed each of the three periods. Ninety days after the October–November period the Dow-Jones Industrial Average had experienced a 12% increase; six months after it was 18%. Ninety days after the January period, the average had risen 7%, six months later, 16%; and ninety days after the June period the average showed another approximately 7% rise, while six months after, despite the Eisenhower heart attack, it had gained 9%. So the periods for which the data
<table>
<thead>
<tr>
<th>Stock</th>
<th>Gross Returns</th>
<th>Cost of Options</th>
<th>Tax on Calls</th>
<th>Other Taxes(^1)</th>
<th>Commissions</th>
<th>Net Profits</th>
<th>Rate of Profit(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balt. and Ohio</td>
<td>$454,274.50</td>
<td>$210,012.50</td>
<td>$4,000.00</td>
<td>$80</td>
<td>$25,582.00</td>
<td>$114,600.00</td>
<td>54</td>
</tr>
<tr>
<td>Boeing Air.</td>
<td>$4,512.50</td>
<td>118,732.50</td>
<td>520.30</td>
<td>129</td>
<td>7,322.30</td>
<td>-32,221.50</td>
<td>-27</td>
</tr>
<tr>
<td>Chrysler</td>
<td>243,812.50</td>
<td>177,148.00</td>
<td>1,265.00</td>
<td>-</td>
<td>19,288.00</td>
<td>56,111.50</td>
<td>31</td>
</tr>
<tr>
<td>Int. Tel. and Tel.</td>
<td>47,062.00</td>
<td>54,587.50</td>
<td>1,410.00</td>
<td>-</td>
<td>10,312.00</td>
<td>-19,247.50</td>
<td>-34</td>
</tr>
<tr>
<td>N.Y. Central</td>
<td>509,500.00</td>
<td>188,599.50</td>
<td>4,170.00</td>
<td>-</td>
<td>27,153.00</td>
<td>289,578.00</td>
<td>151</td>
</tr>
<tr>
<td>Radio Corp.</td>
<td>59,289.50</td>
<td>56,789.50</td>
<td>1,260.00</td>
<td>110</td>
<td>7,209.00</td>
<td>-6,069.00</td>
<td>-11</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>667,037.50</td>
<td>281,387.50</td>
<td>3,670.00</td>
<td>-</td>
<td>31,751.00</td>
<td>350,229.00</td>
<td>123</td>
</tr>
<tr>
<td>Western Union</td>
<td>270,925.00</td>
<td>89,177.00</td>
<td>657.00</td>
<td>108</td>
<td>12,930.00</td>
<td>167,843.00</td>
<td>186</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,346,413.50</strong></td>
<td><strong>$1,176,644.00</strong></td>
<td><strong>$16,952.30</strong></td>
<td><strong>$427</strong></td>
<td><strong>$11,557.30</strong></td>
<td><strong>$920,823.50</strong></td>
<td><strong>77</strong></td>
</tr>
</tbody>
</table>

\(^1\)These arise when stock is purchased to realize the profits from a put.

\(^2\)The "Rate of Profit" is the Net Profit divided by the total initial outlay – the cost of the options plus the taxes on the calls.
were collected were ones followed by significantly rising markets.

Also of significance in attempting to answer this question is the price behavior of the individual stocks whose option activity was summarized. This price behavior is summarized in Table X. The price movements of all eight stocks can be loosely characterized by a "beginning low" price which existed in October, 1954; a subsequent high which usually occurred in the summer of 1955; a low, usually following the Eisenhower heart attack, and the year end price in December, 1955. The middle, high and low prices which are presented in Table X occurred in different dates for the various stocks. As would be expected, the issues in which the large option profits were made occurred in the stocks with the largest price increases. For the four big profit-makers the "maximum percentage increase" in price was at least 97%; these are very large price increases. 10 The four issues whose net result was a loss were not

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10 The Western Union experience is an interesting one. Unlike the other leaders whose stocks were also leaders on the Stock Exchange, the dealing in Western Union on the Exchange was comparatively light throughout its market rise. The average weekly volume on the Exchange for 1954 was 22,200 shares. During the period from October 10, 1954 to April 15, 1955, when the four-for-one stock split was announced, the stock rose from 58 3/4 to 103. During this same period the average weekly volume was 24,800 shares. While this is slightly higher than the average week of 1954, at the same time the total Stock Exchange weekly volume was at a pace about double that of the first three quarters of 1954. Thus Western Union did not increase in volume during its great rise in price nearly as much as overall market volume did. The relative high level of option activity in Western Union and the reverse of this on the exchange at least suggest the possibility of those with inside knowledge profiting from it through the use of the high-leverage options.
TABLE X

Stock Prices, October 15, 1954 - December 30, 1955

<table>
<thead>
<tr>
<th></th>
<th>Beginning Low</th>
<th>High</th>
<th>Low</th>
<th>Final Price</th>
<th>Maximum Percentage Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baltimore and Ohio</td>
<td>27</td>
<td>52 1/2</td>
<td>44 7/8</td>
<td>47</td>
<td>94</td>
</tr>
<tr>
<td>Boeing</td>
<td>60</td>
<td>85 1/4</td>
<td>58 3/4</td>
<td>79</td>
<td>42</td>
</tr>
<tr>
<td>Chrysler</td>
<td>62 3/8</td>
<td>97 3/4</td>
<td>88 1/8</td>
<td>88 1/8</td>
<td>56</td>
</tr>
<tr>
<td>Int. Tel. and Tel.</td>
<td>21 1/4</td>
<td>30 1/2</td>
<td>27</td>
<td>29 1/2</td>
<td>44</td>
</tr>
<tr>
<td>N.Y. Central</td>
<td>19 1/8</td>
<td>48 3/4</td>
<td>43 3/4</td>
<td>45 7/8</td>
<td>156</td>
</tr>
<tr>
<td>Radio Corp.</td>
<td>33 1/4</td>
<td>53 1/2</td>
<td>43 1/2</td>
<td>46 5/8</td>
<td>61</td>
</tr>
<tr>
<td>U.S. Steel</td>
<td>57 3/4</td>
<td>122</td>
<td>108</td>
<td>115</td>
<td>112</td>
</tr>
<tr>
<td>Western Union</td>
<td>54 3/4</td>
<td>108</td>
<td>83</td>
<td>87</td>
<td>97</td>
</tr>
</tbody>
</table>

*Adjusted because of two-for-one split.

**Adjusted because of four-for-one split.
lacking in substantial price increases. The lowest of the "maximum percentage increases" for them was 42% and the others varied up to 61%. So the lack of profitability was not due to insufficient price movements. It was primarily due to the purchase of puts and to the purchases of calls after prices had risen.

Both the general tenor of stock market activity during the periods examined and the rather spectacular behavior of some of the prices of the individual issues examined strongly suggest that the periods under consideration are not typical and that perhaps the eight issues examined are not typical of all option trading. Very few are the market periods when such price rises as these occur among the leading speculative issues - the ones which are likely to be the option favorites.

There are strong a priori reasons for expecting option trading to be less profitable than this over time. If there is a positive return to dealing in stocks - and experience tells us there is - then the return from dealing in options should on the average be less than this, if the returns from dealing in various mediums are to be equalized. For by dealing in options the buyer can take positions in stocks with a lower variance for himself, which in itself is desirable. It should be expected then that to compensate for the lower variance of expected returns, the expected returns themselves should be lower. On these grounds it would seem that the profitability displayed by the eight issues in the periods examined could not be typical of option trading over time.
In computing the profitability of the option trading in the eight issues, the buyers of the options were assumed to use the same strategy throughout; they held the options until expiration date, at which time any profits that may have existed were taken. If some of the papers had been exercised before the end of the option period, the prices might have been more favorable and the profits correspondingly higher. How great were the opportunities for increased profits in the periods examined? The opportunities were limited. In all but one of the eight issues, the price movements that took place were for the most part one way ones - they went up. The exception was Boeing Aircraft. As can be seen in Table X, the price of Boeing rose from 60 to $85\frac{1}{4}, fell to 58 \frac{3}{4}, and rose again to 79. This up-down fluctuation was sufficient to alter considerably the possible profit outcomes for the option buyers. If we attributed to option buyers the ability to close out their option positions in Boeing at the most favorable prices, the results, instead of the loss portrayed in Table IX, would have been gross returns of $189,700, net profits of $57,700 and 48% profitability. This is a substantial change. It must hastily be added, however, that only in retrospect is it possible to close out positions at the most favorable prices. All that has been demonstrated is that in one issue, had the buyers correctly foreseen future prices, they could have profited in this manner. Actually when traders close out their positions before the option expires they may be increasing profits, or they may be taking them too soon, foreshaking bigger rewards. In seven out of the eight stocks examined, profits from options could not have been substantially
increased by closing out the positions before expiration; in the
eighth the profits could have been increased had the buyers been
able to recognize the peaks and troughs of the price movement.

The proceeding discussion has concerned itself with the profits
of the option buyers. We must now turn to those on the other side
of the market - the writers. Estimating their profits (or losses)
is more difficult. One reason is that the option dealers take their
out from the premium the buyer pays, so the amount the writers get is
less than the amount the buyers pay. The size of the dealer take
is difficult to estimate, as has been previously pointed out. If
we accept the claim of some of the dealers that they take about 10%
of a premium, the writers would have received a little over $1,000,000
in the periods examined. To the extent that the conversion costs are
shifted to the dealers, the amount the writers receive will be less
than this.

Another reason for the difficulty in ascertaining the returns
to the writers is that these will depend upon the strategies they
follow; because of the possibilities of converting, they need not
lose what the buyers gain. While option buyers also have a choice of
strategies, in practice they will usually be found to practice the
one ascribed to them: holding the option until it expires at which
time they take their profits. It is more difficult to characterize
the writers' strategies. For the periods under examination we will
work out their returns under two assumptions: first, we will assume
that they write those options desired by the buyers and do no hedging
or converting; and secondly, we will assume they convert their positions
so that they are, in effect, selling puts.

The results of the writers' activities assuming a 10% dealer take and the two different strategies are summarized in Table XI. Strategy I would have been an unfortunate one for the results would have been a loss of $1,505,000. This figure is arrived at by subtracting from the premiums received the costs: the amount of the adverse price movements, the commissions involved in the stock transferred, the taxes paid on these transfers, and an interest charge imputed to the writer on the balances maintained with his brokerage house to meet the maintenance margin requirements of the NYSE. The rate of interest imputed was an annual one of 6%. The size of the wedge between buyer gains and writer losses here is of interest. The differences between these two magnitudes amounted to $531,000; these "friction" costs are substantial.

The actual strategy followed in the period was almost certainly nearer to the second one. Any writer with bullish expectations would tend toward this strategy, of course. Those writers with whom I have spoken tend to pursue this strategy. The results, assuming the second strategy, would have been a profit of $662,000. This figure is arrived at by deducting from the premiums received the costs of the writers: the adverse price movements on the puts exercised, commissions, taxes, and interest. This time the interest is not on 30 percent of the amount involved in an option, but on the entire amount, because stock is actually being purchased.\textsuperscript{11} Again a

\textsuperscript{11} In both cases we are neglecting the margining of the puts. This is legitimate if the same writers are writing both the puts and the calls. (footnote continued on next page)
<table>
<thead>
<tr>
<th>STRATEGY I</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Premiums Received</strong></td>
<td>$1,057,000</td>
</tr>
<tr>
<td><strong>Less:</strong></td>
<td></td>
</tr>
<tr>
<td>Gross Returns to Buyers</td>
<td>2,346,000</td>
</tr>
<tr>
<td>Commissions</td>
<td>142,000</td>
</tr>
<tr>
<td>Taxes</td>
<td>16,000</td>
</tr>
<tr>
<td>Interest</td>
<td>58,000</td>
</tr>
<tr>
<td><strong>Net Profit</strong></td>
<td>($1,505,000)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRATEGY II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Premiums Received</strong></td>
<td>$1,057,000</td>
</tr>
<tr>
<td><strong>Less:</strong></td>
<td></td>
</tr>
<tr>
<td>Gross Returns to Buyers on Puts</td>
<td>15,000</td>
</tr>
<tr>
<td>Commissions</td>
<td>142,000</td>
</tr>
<tr>
<td>Taxes</td>
<td>16,000</td>
</tr>
<tr>
<td>Interest</td>
<td>192,000</td>
</tr>
<tr>
<td><strong>Net Profit</strong></td>
<td>$662,000</td>
</tr>
</tbody>
</table>
6% rate is used. Using this strategy, the rate of return at an annual rate would have been about 21% on the nearly $10,000,000 tied up in the writing. If the writers in their strategies are somewhere between these extremes, the profits will also be in between.

Just as the particular periods examined were atypical with respect to buyers' option profits, so are they for writers. In more typical periods the movements of prices would not be so large in absolute terms, nor would the movements have been so uniformly in one direction. The amount of converting necessary for the best profits would probably be smaller.

In the analysis we have worked out, if writers were in effect writing puts in these periods they would as a group have been making profits on their activities. There are, of course, opportunity costs that are being neglected. Had the writers put their funds into stocks instead of writing options in this period their gains would have been substantial, for these were times of rapidly rising prices. And by writing options the writers have foregone these capital gains. In the past two years these opportunity costs have been large. Most of the glamour of market trading is in the pursuit of these capital gains - speculators buy and sell stocks and buy options with an eye to profiting from price changes. Option writers are "wrong-way" bettors, willing to forego such profits. This sort of activity

(footnote continued) Then in the first case the margining of the calls will suffice for both. In the second case we have assumed the writer to have on balance the amount involved in the option contract; 70% of this can margin his stock purchase, the remainder any put sales.
requires a way-of-thinking and attitude toward risks that few investors have. Although our examination does not reveal it, there is a widespread belief among those connected with the option trade that the writers are the ones (in addition to the dealers) who profit over the long run from the option business. Our findings to the contrary, this assertion may well be the case.12

12 Two other attempts which have been made to determine the profitability of options should be noted. Martin J. King, in a 1954 master's thesis at New York University, Puts, Calls, and Straddles: a Study, computed the profits arising from writing options by taking Wall Street Journal quotations (which are a little high) for 90-day puts and calls. He assumed the writer wrote one put and one call on each of the forty-odd stocks for which premiums were available. He assumed the writer to get the entire amount of the premium, and that he did no converting. He neglected commissions, taxes, and margin requirements. For the period he examined he found, under these assumptions, the writing of options to be highly profitable. Leonard Higgins in The Put-and-Call attempted to ascertain the profitability of London options (pp. 64-75). He worked at it from a different method. He calculated the absolute fluctuations in leading stocks for two-month periods and averaged them to get an average two-month fluctuation. This he considered to be the cost to a writer in writing a straddle, to which he also added other incidental costs such as interest, commissions, etc., as well as a modest margin of profit. This total cost figure was then compared with actual option premiums and found to be much larger. He therefore concludes that option buying was profitable and that writing was not. Implicit in his computation is the assumption that buyers exercise their options at the most advantageous price during the period.
CHAPTER VII

THE EXPECTED VALUE OF OPTION CONTRACTS

Let $x_0$ represent the present price of a stock and $x_1$ the expected price in "period 1." Assume the speculator's expectations concerning $x_1$ take the form of a probability distribution, so that

$$f(x_1/x_0)dx_1 = f(x_1)dx_1; \quad \int_0^\infty f(x_1)dx_1 = 1, \quad x_1 \geq 0.$$ 

Now let us inquire into the expected gains to be had from various options, at first assuming that the options can only be exercised in period 1 at market price $x_0$. Let $\mu_c$ represent the expected value of the gain from a call, where the $c$ signifies the call. Then

$$\mu_c = \int_0^\infty (x_1 - x_0)f(x_1)dx_1$$

is that expected value. In terms of the gain functions discussed in Chapter I, the expected gain from a call represents the average of all possible gains, weighted by the probability of the occurrence of the future prices giving rise to the gains. The above expression can be reduced to

$$\mu_c = \int_0^\infty x_1f(x_1)dx_1 - x_0\int_0^\infty f(x_1)dx_1.$$ 

The last integral is the probability that the price will rise - that $x_1 > x_0$. Designate it by $p$ and the probability that the price will fall by $q$. Then $p + q = 1$. The first integral is the expected value of any rises in price where the rises are weighted by the probabilities of their occurrence. Let $\mu_p$ represent the expected value of any price rise in period 1 and $\mu_q$ the expected value of any positive fall in
the same period. Then

\[ \mu_c = p(\mu_{p_1} - x_o). \]

Under these circumstances we can state the following:

The expected value of a call varies directly with the probability with which a price rise is expected and with the mean of any expected rise.

The expected value of a put can be derived in a similar manner. Where the P signifies a put, it is

\[ \mu_p = \int_{x_0}^{x_1} (x_o - x_1)f(x_1)dx_1. \]

This reduces to

\[ \mu_p = x_o \int_{x_0}^{x_1} f(x_1)dx_1 - \int_{x_0}^{x_1} x_1 f(x_1)dx_1, \]

which in turn reduces - as above - to

\[ \mu_p = q(x_o - \mu_{q_1}). \]

In the situation we are treating, the expected value of a put varies directly with the probability with which a decline in price is expected and with the mean of any expected decline.

The expected value of a straddle can also be obtained:

\[ \mu_s = \int_{x_0}^{x_1} |x_1 - x_0| f(x_1)dx_1 \]

\[ = \int_{x_0}^{x_1} (x_1 - x_0)f(x_1)dx_1 + \int_{x_0}^{x_1} (x_0 - x_1)f(x_1)dx_1 \]

\[ = \mu_c + \mu_p. \]

The result confirms our earlier statement that the straddle is merely a combination of a put and a call.

Consider now the difference between the expected values of a call and a put. Let

\[ E = \mu_c - \mu_p. \]
Substituting (1) and (2) yields
\[ \mathcal{E} = p(\mu_{p_1} - x_0) - q(x_0 - \mu_{q_1}), \]
and this is easily reduced to
\[ (4) \quad \mathcal{E} = \mu_{x_1} - x_0, \]
\( \mu_{x_1} \) being the mean of the expected prices. Under our assumptions, the difference between the expected values of a put and a call is equal to the difference between the present price and the mean of expected future prices. If, and to the extent that, the mean expected future price exceeds the present one, the call will exceed the put in expected value. If the present price exceeds the mean expected price, the reverse will be true. If the expected value of the future price equals the present price, the expected value of the put and call are equal, and the expected value of a straddle is double that of a put or a call.

Now let us consider options written at a price away from the market. Let \( \mu_{C_1} \) be the expected value of a call written a distance \( d \) below \( x_0 \), the present market price. Then
\[ \mu_{C_1} = (x_0 - d)[x_1 - (x_0 - d)] f(x_1) dx_1, \]
which reduces to
\[ (5) \quad \mu_{C_1} = \mu_{C} + d(p + p') + p'(\mu_{p_1} - x_0), \]
where \( p' \) is the probability with which the future price is expected to lie in the interval between \( x_0 - d \) and \( x_0 \), and \( \mu_{p_1} \) is the mean of all expected prices lying within that interval. \(^1 \) Similarly, if the call

\[^1\text{The expected value of a price-differential option is a function of the magnitude of the distance, of course. Or,} \]
is written at a distance \( d \) above the market, the expected value of it is

\[
\mu_C^u = \int_{x_0}^{x_0 + d} (x_1 - x_0 - d)f(x_1)dx_1,
\]

which reduces to

(6) \( \mu_C^u = \mu_C - \left[ p''\left(\mu_{p_1} - x_0\right) + d(p - p'')\right] \),

where \( p'' \) is the probability with which the future price is expected to fall between \( x_0 \) and \( x_0 + d \), and where \( \mu_{p_1} \) is the mean of the expected prices falling in the same range.

Using (5) or (6) we can now examine the validity of the rule of thumb sometimes used in the option market which says that the premium of an option written away from the market should differ from one written at the market by half the price differential. Then, for example,

\[
\mu_C^t - \mu_C = \frac{1}{2} d.
\]

For this rule of thumb to hold, it can be seen from (5) that

(7) \( p + p'\left(1 + \frac{\mu_{p_1} - x_0}{d}\right) = \frac{1}{2} \)

The expression in the parentheses will always be a positive fraction.

If the probability of small price drops are higher than those of large price drops, the expression by which \( p' \) is multiplied will increase with increasing \( d \); \( p' \) will also increase with \( d \) and is

(footnote continued) \( \mu_C^t = \psi(d) \).

If a speculator were able to inform one of the value of \( \mu_C^t \) for all possible \( d \), from this information it would be possible to deduce his price expectations, of \( f(x_1) \). This is analogous to deducing a subjective marginal utility or money schedule by observing the odds at which a person is just willing to take bets of varying sizes.
positive. So if \( p \geq \frac{1}{2} \), not unlikely since the speculator is buying a call, the rule of thumb cannot be accurate, for the left-hand side of (7) will be greater than one half. If \( p \) is approximately one half and \( d \) - and hence \( p' \) - is small, the rule will be approximately correct, and it can be accurate if \( p \) is less than one half and \( d \) is the appropriate size. If \( p \) is about a half and as \( d \) gets larger, the rule of thumb becomes less and less accurate because \( p' \) gets larger and larger. Eventually the rule becomes absurd. Suppose a call, for example, is written twenty points below the market. If the expected value of one written at the market is 5 points, the rule of thumb would designate a value of 15 points for the price-differential paper. This is absurd, however, for it can immediately be exercised for a 20 point gain. So the rule of thumb is of limited usefulness; when the probability of a price rise is approximately one half, the rule does tolerably well for small distances away from the market. Those active in the market are aware of these limitations, of course.  

This rule of thumb most likely originated from common-sense reasoning: if a call is written a little below the market it will be more valuable than one written at the market; if there is a 50-50

\[ p'' \left( \frac{\mu_{p''} - x_0 - 1}{d} \right) + p = \frac{1}{2} \]

where \( p'' \) is the probability that the future price will be between \( x_0 \) and \( x_0 + d \), and where \( \mu_{p''} \) is the mean of the prices in that range. The tendency here would be for the left-hand side of the equation to be less than one half, particularly as \( d \) becomes large.

\[ \frac{1}{2} \]
chance that the price will rise and the call exercised, then there is
a 50-50 chance that this favorable distance will actually be of
advantage to the holder of the call; therefore the holder should be
willing to pay more by the amount of the favorable distance times the
chance of profiting by it — one half the distance. And as we have
pointed out, for small distances this is not bad. The rule probably
got wider recognition, however, from Leonard Higgins’ treatise,
written in London around the turn of the century, in which much
emphasis is placed upon it.\(^3\) He derives the rule by considering
ex post transactions. If two calls are purchased written at \(x_0\),
let us say, and then if stock of half the quantity is sold at \(x_1\),
where \(x_1\) is greater than \(x_0\), it is as if the speculator had purchased
a straddle costing the amount of the two premiums less the distance
between \(x_1\) and \(x_0\). Or, using our notation,
\[ S' = 2C' - d. \]
Now if the conversion had been made at the price at which the option
had been written, then the appropriate expression would be
\[ S = 2C. \]
Assuming \(S = S'\) and solving the equations for \(C\) and \(C'\), the effect of
the transactions away from the option price is found to be
\[ (8) \quad C' - C = \frac{d}{2} \]
Once having arrived at \((8)\) in this manner, however, Higgins proceeds
to apply it to the evaluation of calls being considered ex ante, one
written at the market and the other away from the market. And he
uses \((8)\) as if it must always hold true. In fact, when the probability

of a price rise equals one half, which Higgins always assumes to be the case, his formula can never be accurate, as we have shown using (7). His assurance in using (8) combined with an awareness that actual traders did not always abide by (8), led to inconsistencies and confusion in the pages cited. Inasmuch as there is evidence of his book being considered the authoritative work on option in his time, his apparent proof of the broad use of (8) and his emphasis upon it undoubtedly gave new importance to this rule of thumb.

In the same manner in which (5) and (6) were derived, it is also possible to derive the expected gains from the purchase of puts written away from the market. When the distance is a favorable one (to the buyer),

\[ \mu_{P'} = \mu_P + d(q + q') + q'(x_o - \mu_{q_t}), \]

where the notation is analogous to that used previously. If the distance is unfavorable,

\[ \mu_{P''} = \mu_P - \left[ q''(x_o - \mu_{q_t}) + d(q - q'') \right]. \]

And finally, it is possible to obtain the expected value of a spread. A spread consists of a put and a call, each written an unfavorable (to the buyer) distance from the market. Letting d' represent the distance above the market at which the call is written and d'' the distance at which the put is written, and otherwise the same notation, we get

\[ \mu_{SP} = \mu_S - \left[ p''(\mu_{P''} - x_o) + d'(p - p'') \right] - \left[ q''(x_o - \mu_{q_t}) + d''(q - q'') \right] \]

directly from (6) and (10). The spread has an expected value less than that of the straddle by the amounts by which (6) and (10) are respectively less than (1) and (2).
Now let us consider the manner in which the expected values of options are affected when they can be exercised on or before the expiration date. To do this we shall examine the simplest case where an option can be exercised in either of two periods—period 1 or period 2. We shall assume that the speculator's expectations about future prices take the form of probability distributions—one for each period—and in the first instance that the distributions are independent in the probability sense. Designate these by \( f(x_1) \) and \( f(x_2) \). In addition to a knowledge of the expectations concerning future prices, to evaluate expected value of an option we must know the strategy the holder will be following with respect to when he exercises his option. The strategy we impute to him—and the one most consistent with an entire approach—is that he exercise his option in period one if the gain from so doing exceeds the expected gain to be had from holding it until period two. With these assumptions the analysis can be extended to the present case.

First consider a call. Let \( x_a \) be the critical price in period one (the critical \( x_1 \)) at which the holder will exercise his call. We define \( x_a \) such that

\[
x_a - x_o = \int_{x_0}^{\infty} (x_2 - x_0) f(x_2) dx_2,
\]

\[
x_a - x_o = p_2 (\mu_p - x_o),
\]

\[
x_a = p_2/\mu_p + q_2 x_o.
\]

The expected value of a call is the expected gain in the first period plus the expected gain in the second period, each weighted by the probability of their occurrence. So
\[
\mu_C = \int_a^\infty (x_1 - x_o)f(x_1)dx_1 + p_a(\mu_{p_a} - x_o) \int_0^{x_a} f(x_1)dx_1.
\]

Let \( p_a \) represent the probability that the price in period one equals or exceeds \( x_a \); then \( q_a \) is the probability that it does not. Our expression can be summarized as

(12) \[ \mu_C = p_a(\mu_{p_a} - x_o) + q_a p_2(\mu_{p_2} - x_o). \]

From the manner in which we approached the problem, it is clear that the increase — call it \( \gamma \) — in the expected value of a call due to the privilege of exercising in period one as well as in period two is represented by

(13) \[ \gamma = p_a \left[ (\mu_{p_a} - x_o) - p_2(\mu_{p_2} - x_o) \right]. \]

To the extent that there are expected gains in period one greater than the expected gain in period two, the expected value of the call increases.

The two-period case can also be worked out for a put using the same assumptions. Let \( x_b \) be the critical price at which the put is exercised in period one. We define it such that

\[ x_b - x_o = q_2(x_o - \mu_{q_2}). \]

Then using analogous notation, the expected value of a put which can be exercised in either period one or two is

\[
\mu_P = \int_0^{x_b} (x_o - x_1)f(x_1)dx_1 + q_2(x_o - \mu_{q_2}) \int_a^{x_b} f(x_1)dx_1.
\]

And

(14) \[ \mu_P = q_b(x_o - \mu_{q_b}) + p_b q_2(\mu_{q_2} - x_o). \]

This expected value exceeds that of a call which can only be exercised in period two by \( \gamma \) which is represented by
\[ J = q_b \left[ (x_o - \mu_q) - q_2(\mu_{q_2} - x_o) \right]. \]

This expression has an interpretation analogous to (13).

If we now inquire into the difference \( \bar{J} \) between \( \mu_c \) and \( \mu_p \), we find it is the following function:

\[ \bar{J} = p_a(\mu_{p_a} - x_o) + q_b(\mu_{q_b} - x_o) + q_a p_2(\mu_{p_2} - x_o) + p_2 q_2(\mu_{q_2} - x_o). \]

Concerning (16) we shall be content to say that if both \( \mu_{x_1} \) and \( \mu_{x_2} \) are greater than or less than \( x_o \), (16) will be positive and negative, respectively. If \( \mu_{x_1} = \mu_{x_2} = x_o \) and \( f(x_1) \) and \( f(x_2) \) are symmetrical about their means, (16) = 0, the expected value of a call equals that of a put, and that is double that of a single option.

These results hold if the probability distributions which characterize the price expectations in the two periods are independent in the probability sense. We now examine the case where they are not independent. We assume the speculator has expectations as to period-one prices as before, and that the expectations about period two are conditional, depending upon what happens in the first period. We assume the conditional distribution to be known. Thus the marginal distribution for period two prices can be determined:

\[ f(x_2) = \int_0^\infty f(x_2|x_1)f(x_1)dx_1. \]

Now let us consider the expected value of a call which can be exercised in either period one or two. If the holder waits until period two, his expected gain is as usual, equal to \( p_2(\mu_{p_2} - x_o) \), using the marginal distribution derived above. Again the holder will exercise in period one, if, in so doing, his gain exceeds the expected gain to be had in period two. Thus, he will exercise in period one upon the occurrence of all \( x_1 \) such that
\[ x_1 > x_0, \]

\[(17) \quad x_1 - x_0 > \int_{x_0}^{x_1} (x_2 - x_0) f(x_2 | x_1) dx_2. \]

Using our usual notation with a prime indicating the conditional probability distribution, the latter condition reduces to

\[(18) \quad x_1 > p_2 \mu_{p_2} + q_2 x_0. \]

It is of interest to note that this is not the same as stipulating that the option will be exercised in period one if the price in that period exceeds the expected price in period two. This stipulation would require that

\[(18a) \quad x_1 > p_2 \mu_{p_2} + q_2 \mu_{q_2}. \]

In general, (18) and (18a) are not the same. If prices in period two below \( x_0 \) are expected with zero probability, then (18) and (18a) are identical. Since \( x_0 \) must always be greater than \( \mu_{q_2} \) by definition of the latter term, (18) is a stronger requirement than (18a) (except for the case when they are identical). If the passage of stock prices through time is thought to be in the nature of a random walk process, then (18) will rule out the exercising of an option before the expiration date unless the mean of the process is other than zero and the option held is one that profits from the "short" odds. If the process is a "fair" one, the option will be held until expiration.

Assume all \( x_1 \) which satisfy (17) and (18) fall in the interval between \( \alpha \) and \( \beta \). Then \( \int_{\alpha}^{\beta} f(x_1) dx_1 \) is the probability of this occurrence. Let \( g(x_2) \) represent the distribution of expected prices in period two, given that \( x_1 \) does not lie between \( \alpha \) and \( \beta \). Then

\[ g(x_2) = \int_{\alpha}^{\beta} f(x_1 | x_1) dx_1 + \int_{\alpha}^{\beta} f(x_1) f(x_2 | x_1) dx_1. \]
We are now able to derive the expected value of the call,

\[(19) \quad \mu_c = \int_{x \in \alpha} (x_1 - x_0) f(x_1) dx_1 + \int_{x \in \gamma} (x_2 - x_0) g(x_2) dx_2.\]

In similar manner, assume all \(x_1\) for which a put will be exercised in the first period to lie in the interval between \(\gamma\) and \(\delta\), and let \(h(x_2)\) be the distribution of expected prices in period two, given that \(x_1\) not be exercised in period one, then

\[(20) \quad \mu_p = \int_{x \in \gamma} (x_1 - x_0) f(x_1) dx_1 + \int_{x \in \delta} (x_0 - x_2) h(x_2) dx_2\]

is the expected value of the put.

It is difficult to say what, if any, are the likely ranges for the intervals \(\alpha\) to \(\beta\) and \(\gamma\) to \(\delta\) for the typical speculator. Perhaps they would be for extreme period-one price movements. That is, if the price of the stock in period one was very high a downward reaction might be expected in period two; similarly a upward reaction might be expected if the period-one price were to fall to a very low, unanticipated level. Perhaps these expectations might be appropriate for chartists who look for "technical" price movements.

The fact that the options can be exercised in period one as well as in period two raises the expected value of a call by an amount

\[(21) \quad \mathcal{J} = \int_{x \in \alpha} (x_1 - x_0) f(x_1) dx_1 - \int_{x \in \gamma} (x_2 - x_0) f(x_2 | x_1) f(x_1) dx_2 dx_1.\]

The value of a put is increased by

\[(22) \quad \mathcal{J} = \int_{x \in \gamma} (x_0 - x_1) f(x_1) dx_1 - \int_{x \in \delta} (x_2 - x_0) f(x_2 | x_1) f(x_1) dx_2 dx_1.\]

Up to this point we have neglected the possibilities of conversion in determining the expected values of options. Because of conversion actual premiums may be expected to diverge from the expected
values of options in two respects. The first is the constraint that is put upon the premiums of puts and calls that are written for the same period. Because a put can be converted into a call by buying the stock and a call into a put by selling the stock, the difference between the premiums of the put and call should not differ by more than the cost of conversion. If they do, there is room for profit in arbitraging. So on these grounds the $S$ of (13) and (16) should never exceed the cost of converting. This cost will be a function of the price on the stock on which the option is written.

Conversion is of significance in a different manner when options cover more than one period. We have seen in (13), (15), (21) and (22) that the privilege of exercising an option prior to its termination enhances its expected value. An option of the London-type which can only be exercised at the end of the option period can in practice be exercised through conversion - by dealings in firm stock in the interim, profits can be taken. For example, if a 90-day call is purchased at $40 and the stock moves to $60 in 60 days, by selling the stock on the market the 20 point profit is taken (less the cost of converting) and the holder has a 30-day put at $40 on the stock. The holder of an American-type option can take his profits in this manner also, of course. Thus he can contemplate three alternatives: holding on to the option until the next period, exercising, or converting. He will convert, if the expected value of the new synthetic option exceeds the cost of conversion, or in the case of a call if

$$\int_0^\infty (x_0 - x_2) f(x_2/x_1) f(x_1) dx_2 dx_1 > K,$$
the cost of the conversion. While this may serve to augment the expected value of an option, in practice it cannot be of much importance. It does not seem typical that expectations be of this nature - price rises one period hence are not usually held to pressage significant falls in the second period hence. We conclude that in the kind of a world which we are describing, the privilege of exercising an option before its natural expiration is of more significance than the possibility of converting in regard to the manner in which the expected value of an option is augmented.

Let us now inquire into the manner in which dividends are treated in option trading. Whenever a stock goes ex-dividend on the Exchange, the option price is automatically reduced by the amount of the dividend. This is in line with the Exchange policy of marking down all existing open bids and stop orders to sell by the amount of the dividend at the ex-dividend date. But actual market prices do not necessarily fall by the amount of the dividend. In fact, studies made of price behavior at ex-dividend time indicate the average drop in price to be about eight-tenths of the dividend.\footnote{Paul B. Readett, Jr., The Price Behavior of Stocks on Their Ex-Dividend Dates, unpublished master's thesis, Massachusetts Institute of Technology, 1956. See also James A. Campbell and William Beranek, "Stock Price Behavior on Ex-Dividend Dates," Journal of Finance, (December, 1955) pp. 425-9.} The result of this divergence between assumed and actual price movements affects the expected values of options. Where the size of forthcoming dividends is known and the declaration of them is not subject to doubt, the option treatment of dividends leads to increases in the expected value of calls for those expiring shortly after ex-dividend dates.
amounting to two tenths of the dividend times the probability of the call being exercised. Similarly, the expected value of such a put is reduced by two tenths of the dividend times the probability of the put being exercised. And equation (4), for example, which relates the differences in the expected values of calls and puts, becomes

\[ \xi = \mu x_1 - x_0 + .2v \]

where \( v \) is the amount of the dividend. The treatment of dividends tends to favor calls to the detriment of puts.

Since option premiums are in large measure determined by the price expectations of those active in the option market, one could hope to find in the relations among premiums some yardstick of and clue to these expectations. The use of (23) could provide such. Relationship (23) holds only when the option can be exercised in the last period and when the possibilities of converting are neglected. But for many "normal" kinds of expectations these other considerations are not relevant, and (23) is therefore useful. If we observe issues for which the dividend can be expected with a good deal of certainty, and if we observe the differences between the premiums of, say, a 90-day call and put,\(^5\) it becomes possible to obtain what from (23) we would expect to be the difference between the mean of expected prices and the present price.

As an example of the use of (23), consider Baltimore and Ohio 90-day premiums at two different dates. On January 17, 1955, both premiums were quoted at $350. No dividend adjustment need be made

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\(^5\)The six month options would be less appropriate because different tax treatment of put and call premiums would tend to distort the premiums.
because under a reorganization ruling, the railroad could only declare year-end dividends. Thus the mean of expected prices equaled the present price. On June 20, 1955, a 90-day call was quoted at $4.50, a put at $3.50. Again no dividend adjustment need be made. The mean of expected prices 90 days hence was expected to be one point higher than the prevailing 50 1/4. Thus applied to many issues in this manner (23) might be used as a measure of the expectations of option traders.

Puts are used as a means of protecting paper profits that have been made from a long position. An alternative means of protection is the stop-loss order. This is a sell order, in this instance at some price below the market which becomes operative, should the market price drop to this level. It costs nothing to put in such an order. Why should an investor purchase a put for protection, rather than use the stop-order device? There are two reasons. The first and less important one is that there is always a possibility that the market price will not fall in a smooth, continuous fashion and that the market will by-pass the price at which the order becomes operative — thus there is a possibility of the order being executed at a lower price. With a put there is the assurance of being able to sell at the stipulated price. The second reason that puts are used in this fashion is that because of the length of the duration of the contract they enable the investor to judge better the nature of any price decline. The kind of protection desired by the investor is one which protects him against long-run declines in price. If the market price declines to level of the stop-loss order, the sale is executed and
the investor is closed out. If this should prove to be a temporary
decline and if the price returns to higher levels once again, the
investor will have been closed out, when in retrospect, he would
not have wanted this to happen. If he had held a put, on the other
hand, and it extended in length beyond the period of the temporary
fall, his position would have been maintained and not closed out.
So putting this in terms of our two-period analysis, letting \( P \)
designate the cost of the put, and assuming the put is written at
\( x_s \), the stop-loss price, the investor will purchase a put rather than
put in a stop-loss order when

\[
(24) \quad P < \int_0^{x_s} \int_{x_s}^{x_2} (x_2 - x_s) f(x_1, x_2) dx_2 dx_1.
\]

And if on average the market can be expected to slip past the stop-
loss price the distance \( \lambda \), then the expression

\[
\lambda \left[ \int_0^{x_s} f(x_1) dx_1 + \int_{x_s}^{x_2} \int_0^{x_s} f(x_1, x_2) dx_2 dx_1 \right].
\]

must be added to the right-hand side of inequality \( (24) \).6

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6This discussion of the use of stop-loss orders suggests one way of
duplicating an option gain function. Suppose it is a call that is
wanted at some price \( x \) below the present market price. Assume the
speculator to hold the stock. The following order, if it could be
placed, would almost duplicate a call: Sell the stock whenever the
price falls to \( x \); when the price rises to \( x \) again, buy the stock;
sell if it falls to \( x \) again; buy if it rises to \( x \) again, etc. The
buy and sell orders are at the same price, but the buy orders are
triggered by price movements which hit \( x \) from below, and the reverse
for the sell orders. The gain function of the call could be exactly
duplicated in this manner if all price movements always passed
through \( x \) and \( x \) never became a peak or a trough.
Let us now consider how option premiums will vary with the length of the option contract. From our analysis it is evident that a two period contract is more valuable than a one period one. In general, however, unless something is known of the distributions of the expectations, it is not possible to specify how much more valuable a longer contract is than a shorter one. If the distributions are specified, the answer is a determinate one.

The problem has been attacked by a French statistician, M. Bachelier, in a treatise published in 1900.\(^7\) Bachelier assumes price expectations to be normally distributed with zero mean and variance a function of time, and he assumes prices to take a "random walk" over time. Using these assumptions, the distribution of prices in any future period is normal and the expected value of simple options—calls or puts—can be calculated. Bachelier finds call or put premiums to be proportional to the square root of time.

An evaluation of the universality of Bachelier's conclusion and an illumination of the general principles we have obtained can be had by considering the expected values of options under some simple postulated stock price movements. Let the first of these be the usual fair random walk. From any given position assume the price can go either up one unit with probability one half or it can go down one unit with probability one half. Or, in terms of the deviations from some starting price, the possible prices through the next few periods

\(^7\)\textit{Theorie de la Speculation} (Paris). This work, which was Bachelier's doctoral dissertation, became known to me after most of my analysis had been completed. Some of the results which I have presented are also found in it.
will look like this, with the probabilities indicated in parentheses:

\[
\begin{array}{cccc}
+5 & (1/32) \\
+4 & (1/16) \\
+3 & (1/8) \\
+2 & (1/4) \\
+1 & (3/8) \\
0 & (1/2) \\
-1 & (3/8) \\
-2 & (1/4) \\
-3 & (1/8) \\
-4 & (1/16) \\
-5 & (1/32) \\
\end{array}
\]

Consider calls written at the original price with varying lengths. Their expected values as of time zero will depend solely upon the marginal distribution of prices in their termination period, because (18) is not satisfied. These expected values are presented in Table I.

**TABLE I**

<table>
<thead>
<tr>
<th>Length</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/2 = .5</td>
</tr>
<tr>
<td>2</td>
<td>1/2 = .5</td>
</tr>
<tr>
<td>3</td>
<td>3/4 = .75</td>
</tr>
<tr>
<td>4</td>
<td>3/4 = .75</td>
</tr>
<tr>
<td>5</td>
<td>15/16 = .938</td>
</tr>
<tr>
<td>6</td>
<td>15/16 = .938</td>
</tr>
<tr>
<td>7</td>
<td>35/32 = 1.094</td>
</tr>
<tr>
<td>8</td>
<td>35/32 = 1.094</td>
</tr>
<tr>
<td>9</td>
<td>315/256 = 1.230</td>
</tr>
<tr>
<td>10</td>
<td>315/256 = 1.230</td>
</tr>
</tbody>
</table>
Because of the nature of the hypothesized price movement, the expected value of a call increases every two time periods. On this account, it is obviously not possible with this kind of price movement for the expected value of a call to be exactly proportional to the square root of time. However, if the time periods are numbered according to each different expected value, those values are approximately proportional to the square root of time. If we let their value equal \( k/t^{1/2} \), in the five periods \( k \) assumes the values 0.5, 0.530, 0.541, 0.547, and 0.551. Here \( k \) increases slowly and at a decreasing rate.

Suppose in this situation an investor has a paper profit he wishes to protect. He considers putting in a stop-loss order at -1, or purchasing a five-period put written at -1. If he uses the stop-loss order there is a probability of 7/16 that he will have been closed out and that the price in period five will not be lower than in period zero. Applying (24) a put will be purchased if the premium is less than 7/16. Applying (10) we find that such a put will have an expected value at time zero of 7/16. So if its premium reflects the actuarial value of the option, its cost will equal, but not be less than, the amount by which the put is preferable to a stop-loss order. If it is considered at all possible that the stock price slip past the stop-loss price, the put will be preferred to the stop-loss order.\(^8\)

\(^8\) The results of our example here accord to the rule of thumb discussed above. A put a point away from the market cost 7/16, one at the market costs (from Table I) 15/16. The difference between the premiums is half the distance between the prices. But note that a put written at -2 could not have a premium such that the rule of thumb holds.
Consider now a similar walk. Suppose that from any starting position the stock price can remain unchanged with a probability of $1/3$, go up a unit or down a unit with a probability of $2/9$ for each, and go up or down two units with a probability of $1/9$ for each. Again (18) is not satisfied and an option will not be exercised before termination date. The expected values of calls of duration of one to four periods are respectively, $0.45$, $0.61$, $0.791$, and $0.915$. Again letting these be represented by $k/\sqrt{t}$, $k$ will equal $0.45$, $0.54$, $0.57$, and $0.58$. Again the proportionality of the square root of time is a good approximation to the expected values.

Again, consider an investor who is thinking either of putting in a stop-loss order at $-2$ or buying a four-period put written at $-2$. Using (10), the cost of such a put - assuming the cost to correspond to expected value - will be $0.238$. Using (24), we find a put to be wise if its premium is less than $0.267$. The investor will be better off buying the put than inserting the stop-loss order. This will be accentuated if there is a possibility of the market price by-passing the stop-loss order.

Consider still another random walk. From some initial starting price assume subsequent prices can increase one unit with a probability of $0.6$ or decrease one unit with a probability of $0.4$. Again, for a call (18) is not satisfied and the holder of the call will wait for termination of the option to exercise. The expected values of calls from one to five periods long are, respectively, $0.6$, $0.72$, $1.080$, $1.210$, and $1.512$. The proportionality to the square root of time does not work so well here, again representing these values by $k/\sqrt{t}$ yields
k's equal to .6, .509, .625, .605, and .676. They increase in a fluctuating manner, with damped oscillations.

The expected values of the puts are interesting. If the puts could only be exercised in the termination period the expected values for papers one to five periods in length would be .4, .32, .48, .410, and .512. However, the equivalent of (18) is satisfied here, and the privilege of exercising on or before the termination dates increases the expected values to .4, .4, .496, and .519. The holder of a put could exercise whenever the price fell to -1; he would never wait for it to fall to a lower price. Depending upon the cost of conversion, it may pay the holder of a put to convert, once the price has moved to -1. We assume it does not pay to convert immediately, which means in this example that converting does not cost less than .993 (1.512 - .519). But should the price move to -1 in period one, the expected gain from converting is 1.181; if this exceeds conversion costs, it will pay to convert.

The wisdom of buying a put rather than using a stop-loss order is rather obvious in this case.

The final example we shall work out is one with independent probability distributions. Assume the speculator foresees an upward trend of prices, the trend increasing by one unit each period. Prices are expected to be exactly on the trend with 1/3 probability, one unit above or one below the trend with 2/9 probability each, or two units above or two units below with a probability of 1/9 each. The expectations for two periods would look like the following in terms of distances from the starting price:
A one-period call has an actuarial value of $10/9$; a two-period call which can only be exercised in period two has a value of $2$. The privilege of exercising in period one or two increases the value to $19/9$, since there is a price which might occur in period one which exceeds the expected value of exercising the call in period two.

As an empirical check on M. Bachelier's result, the ratio of six-month call premiums to 90-day call premiums and six-month put premiums to 90-day put premiums were computed for three different weeks for which quotations were available. Since the one period is twice as long as the other, the premiums should be in the ratio of the square root of two, or $1.414$, to one. The results of the computations are, for puts, ratios of $1.340$, $1.321$, and $1.345$; for calls, ratios of $1.422$, $1.393$, and $1.408$. These ratios are, in a loose sense, "not bad." The calls correspond better to the proposed proportionality than do the puts, which are a bit low in terms of their ratios. While these bits of evidence by no means prove that

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9. The computations were made by dividing the sum of the six-month premiums by the sum of the 90-day premiums for some forty-odd issues for each of the three weeks. The quotations were for the weeks of November 8, 1954, January 17, 1955, and June 13, 1955.

10. The fact that the ratios of six-month to 90-day call premiums exceeds the similar ratio for puts could reflect unsymmetric price expectations, or it could reflect the tax advantage that the long-term call receives.
stock market price movements can be characterized by Bachelier-like random walks, as a rough rule of thumb perhaps using the square root of time is passable. 11

In all the analysis up to this point we have assumed the speculators to have certain expectations in the sense that they could be described as probability distributions. In the Knightian terminology, our analysis has been of a risky, but not uncertain, world. Speculation is uncertain as well as risky. In terms of our approach, speculators do not know with certainty the probability distributions of future prices. Briefly we shall attempt to examine the effect of the uncertainty factor upon the results already achieved.

Generally speaking, the confidence with which expectations are held decreases the further into the future is the period for which the expectations hold. With the passage of time the price expectations for any given period should eventually become more precise and should be held with more confidence. As the period approaches more relevant information becomes available and our guesses can become more informed. But also with the passage of time a pattern of prices is being established against which the previously made estimates can be compared. If they are confirmed, the confidence with which the other expectations are held can be expected to increase. If the previous expectations did not materialize, an agonizing reappraisal can be made

11 Actually the length of the longer-term option is usually a bit more than double the length of the 90-day paper. If we consider the "six months" to be six months and ten days, as it often is, then the factor of proportionality should be 1.452 rather than 1.411, and all the computed proportions are low. But just as the six month papers are often actually ten days longer than the six months, so the 90-day papers are often 92, 93, or 94 days long.
and a correction factor should improve the future expectations. In short, in uncertain situations the degree of confidence with which expectations are held changes, and expectations themselves may change.

Because of the presence of uncertainty, those features of an option which introduce flexibility into option trading assume more importance. The privilege of exercising before the expiration date becomes more valuable. The possibility of conversion becomes even more prominent for should the direction of expected prices change with the passage of time, converting can change the direction of the market position. Thus expressions (13), (15), (21), and (22) probably understate the increments that the elements of flexibility give to the expected values of options. Likewise (24) understates for the same reason the value of the use of a put rather than a stop-loss order.
CHAPTER VIII

THE VARIANCE OF EXPECTED OPTION GAINS

Up to this point our analysis of option trading has been in terms of but one moment of the distribution of expected profits, the mean. While no doubt this is the most important moment to a trader, the others are not without some significance. In this chapter we shall consider some of the respects in which the most important of the others, the variance of expected profits, affects option trading.

Consider first the variance of the expected returns from a call. We shall use "one-period" analysis and assume there are no dividends involved. Since the variance of a variable \( y \) is defined as

\[
\sigma_y^2 = \int_{-\infty}^{\infty} y^2 f(y) dy - \mu_y^2,
\]

we obtain the variance of the expected gains from a call as

\[
(1) \quad \sigma_c^2 = \int_{X_0}^{\infty} (x - x_0)^2 f(x) dx - \mu_c^2.
\]

We shall not find it necessary to reduce this expression further. Generally speaking, the broader is the tail of the price-expectation probability distribution above \( x_0 \), the larger will be the variance of the call.

Contrasted to this is the variance stemming from the usual long position, obtained by purchasing stock. The expected gain here, \( x - x_0 \), is distributed as \( x \) is itself, and therefore the variance of expected gain from buying stock is identical to the variance of the expected prices themselves. So

\[
(2) \quad \sigma_{x_0 - x}^2 = \sigma_x^2 = \int_{0}^{\infty} x^2 f(x) dx - \mu_x^2.
\]
It can be shown that \( \sigma_x^2 \geq \sigma_c^2 \). To demonstrate this we will not work from (1) and (2) directly, but will use the following result from statistics:

\[
\sigma_{ay}^2 + b \sigma_z^2 = \frac{a \sigma_y^2 + b \sigma_z^2 + 2ab \rho \sigma_y \sigma_z}{1 + \rho^2},
\]

where \( y \) and \( z \) are variables, \( a \) and \( b \) are constants, and \( \rho \) is the correlation coefficient between \( y \) and \( z \). Recall from Chapter I that buying stock is equivalent to buying a call and selling a put, or in terms of vectors,

\[
\begin{bmatrix} 1 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ -1 \end{bmatrix} - \begin{bmatrix} 1 \\ -1 \end{bmatrix}.
\]

Thus, using (3), we get

\[
\sigma_x^2 = \sigma_c^2 + \sigma_p^2 + 2 \rho \sigma_c \sigma_p.
\]

If \( \sigma_p^2 = 0 \), then \( \sigma_x^2 = \sigma_c^2 \); this will occur if the probability of the price falling below \( x_0 \) is zero. If \( \sigma_p^2 \neq 0 \), and \( \rho \) is positive, \( \sigma_x^2 > \sigma_c^2 \). We can graphically demonstrate that \( \rho \) is positive.

Figure 1 portrays the locus of all possible combinations of gains from buying a call and selling a put. The least-squares regression lines - the line which minimizes the sum of the squares of the vertical distances between it and the cornered locus, and the line which minimizes the sum of the squares of the horizontal distances - obviously must

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The variance of expected gain from buying a put is identical with the variance of the expected loss from selling it. This is because the gain function of the one is the negative of the gain function of the other. Thus it is not necessary in (4) to designate by notation that it is the writing of a put that is involved. It is also true that the variance of the expected gains from buying stock is identical with the expected gains of selling stock.
Figure I. Possible Gains from Simultaneous Purchase of Call and Sale of Put
have a positive slope. Thus $\rho > 0^2$ and $\sigma_x^2 \geq \sigma_c^2$. It holds equally well that $\sigma_x^2 \geq \sigma_p^2$.

The lower variance of the option position as contrasted with the regular firm position provides the insurance use of the option. A trader who becomes somewhat hesitant of future price increases or decreases turns a firm position into the lower-variance option position by the purchase of an option - a put if it is a long position he wishes to protect, or a call if it is a short position. He still stands to gain, of course, from further price increases or declines, as the case may be, but he will not suffer large loss if his hesitancy becomes justified.

Because the variance of expected gain is smaller from purchasing a call rather than stock, among persons averse to risk one should expect the expected gain from a call to be less than that from stock purchases, or

$$\mu_c - P_c \leq \mu_x - x_0,$$

where $P_c$ represents the premium for the call. These are alternative methods of speculating on the same price movements. One method should not be better in both respects than the other. If it were, rational

---

2 There is an exact relationship between $\rho$ and the slopes of the least-square lines. If $a + bx$ is the equation of the straight line which minimizes the sum of the squares of the vertical distances, and if $c + dx$ is the equation of the line which minimizes the sum of the squares of the horizontal distances, then

$$\rho = \sqrt{bd}.$$ 

In our problem the exact value of the slopes will be dependent upon $f(x)$, but both will be positive.
speculators would be concentrating their efforts on options and neglecting stock purchases. This they do not do. So on this basis we deduce that in reality the expected gain from options is less than that from stock.

It is important to note, however, that this is not the same as saying that if an investor puts his money into options rather than into stocks his expected return will be smaller and so will his variance. We have demonstrated that a call on 100 shares has a lower variance than does the expected gain from buying 100 shares, and we have hypothesized that the expected gain of that call must be less than the expected gain of the stock purchase. But the dollar cost of assuming the option position is much less than that of buying stock. So the results would be different if the speculator were thinking of putting the same amount of money into either options or stock. Suppose that with the money required to buy 100 shares of stock, \( \beta \) calls, each on 100 shares, can be purchased. Then the choice for the investor is between an investment with expected gain \( \mu_X - x_0 \), and variance \( \sigma_X^2 \), and another investment with expected gain \( \beta (\mu_C - c) \) and variance \( \beta \sigma_C^2 \). For six months' calls, \( \beta \) may perhaps be as large as 10. The variance of the expected gain from 10 calls is 100 times the variance on one call. If equivalent amounts of money are invested in options as compared with stocks, the variance inequality most likely is reversed: the stock position has a lower variance of expected gain than does the option position. It also could be possible that the hypothesized second inequality, (5), be reversed:
the expected gain from the option position may now exceed the expected
gain from the stock position.

That $\beta$ is so large reflects the leverage which exists in options.
This gives rise to the speculative use of options. The attraction
here is not a lowering of the variance. In fact, as we have seen, if
a speculator deals in options on a greater number of shares than he
would be dealing in stock, the option transactions may well be
increasing the variance of his portfolio. Thus the same option
contracts may provide the means whereby a conservative investor
hedges a position and reduces the variance of his holdings, while
they provide another with a highly-leveraged means of speculation
which serves to increase the variance of his expected gains.

There is another respect in which the variance of option positions
is of importance in option trading. A trader who enters the option
market can either purchase or sell puts, calls, or straddles.
Because of the possibilities of conversion, however, his position can
be transformed into any mixture of these positions; there are
innumerable intermediate positions. For example, suppose a trader
buys a call on 100 shares of a stock. If, at the same time he sells
50 shares, we know from Chapter I that his position is a synthetic
straddle; if he sells 100 shares it is a synthetic put. But he could
also sell 10 shares, or 40 shares, or 80 shares, and his resulting
positions would be a mixture of calls and puts. It is an observed
fact that some traders - particularly the writers - assume these
intermediate, or "mixture" positions. Let us inquire into the circum-
stances in which a trader will behave in this fashion.
It can be shown that if a trader maximizes his expected gain, he will never prefer an intermediate position. Let us represent all the various option positions by the two vectors

$$\begin{bmatrix} 1 \\ 0 \end{bmatrix} + k \begin{bmatrix} -1 \\ 1 \end{bmatrix}, \quad \text{where } 0 \leq k \leq 1.$$

The first vector represents the purchase of a call and the second the sale of \(k\) shares of stock.\(^1\) As \(k\) varies from zero to one, all possible positions are portrayed. Thus, if \(k = 0\), the position is a call; if \(k = 1/2\), it is a straddle; if \(k = 1\), it is a put; etc.

Corresponding to each of the possible positions is an expected return, and also there is a cost associated with assuming the position. Let us consider the expected returns first; as \(k\) varies, call the locus of all expected returns the returns function. Assume the trader to have price expectations for the future period under consideration which take the form of a probability distribution, as we have been assuming all along.\(^2\) Relying on our previous analysis, we obtain the revenues function, \(R\), as

$$R = \int_{x_0}^{\infty} (x - x_0)f(x)dx + k \int_{0}^{\infty} (x_0 - x)f(x)dx,$$

which reduces to

(6) \quad R = \mu_c + k(x_0 - \mu_x).

The first term is the expected return, or expected value, of a call; the second is \(k\), the amount being sold, times the expected return of selling stock. The revenues function is, of course, a function of \(k\).

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\(^1\)The units of the two vectors must be the same. If the call is on 100 shares of stock, then the second vector must represent the sale of 100k shares of stock.

\(^2\)We shall use a "one-period" analysis here and shall neglect dividends.
Furthermore, with any given set of expectations, the function is a linear one in \( k \), for then \( \mu_c \) and \( \mu_x \) become constants. Since

\[
\frac{dR}{dk} = x_0 - \mu_x ,
\]

as \( k \), or the amount of converting that is being done, is increased, the expected returns will increase if the mean of expected prices lies below the present price. If the mean of expected prices exceeds the present price, however, increasing \( k \) will reduce \( R \).

There are costs involved in assuming each of the possible option positions. Since options can be purchased in three forms, there are three ways of getting to the various positions, and there may be different costs associated with each approach. Suppose the option trader faces the following premiums: \( P_c \), the premium for a call; \( P_p \) for a put; and \( P_s \) for a straddle. Assume that the costs of buying and selling stock are proportional to the quantity of stock involved in the transaction, and that the factor of proportionality is \( \alpha \). \(^3\)

Then, for example, the cost, \( C \), of assuming the positions based upon a purchase of a call would be

\[
C = P_c + \alpha k .
\]

This cost function is linear in \( k \) also, and

\[
\frac{dC}{dk} = \alpha .
\]

It is now evident why a trader only interested in maximizing his expected returns will not assume an intermediate position. It will pay him to

\(^3\)These costs would not be strictly proportional in practice; they would be some function of the quantity, increasing at a decreasing rate. This will tend to reinforce the results we get using proportional costs. We also assume that the cost of buying stock is the same as that of selling.
convert from the straight call position if \((x_0 - \mu_X) > \alpha\), and he will do so. But it will pay him to convert all the way to the put position, for there expected profits will be the highest. As long as both the cost and revenue functions are linear in \(k\) (or the cost function is increasing, but at a decreasing rate), if it pays to move from an initial position at all, it will pay to convert to another initial position - in our case from a call to a put.\(^4\)

The situation would be the same if the trader should begin from either a straddle or a put position. We could find a \(C^1\) cost function based upon the purchase of a straddle or a \(C^2\) function based on the purchase of a put. Both of these would also be linear under our assumptions, and the same conclusions would result.\(^5\) Thus the maximization of expected profits does not explain option traders taking intermediate positions.\(^6\)

The assumption of these intermediate positions can be explained in rational terms if the variance of the expected returns is considered as well as the mean. Whereas a high level of the mean profit is

\(^4\)There is the obvious exception. If \((x_0 - \mu_X) = \alpha\), the trader will be indifferent among the positions, profit-wise. If we require that expected profits must increase if conversion is to be done, then this case is ruled out. (Note that this is a standard linear-programming problem, and the Dantzig theorem of equilibrium at a vertex point applies.)

\(^5\)It should be noted that to be comparable with the other functions, \(C^1\) must be based on the purchase of a straddle on half the quantity that the put or the call cover, because the straddle is a double option.

\(^6\)This analysis has been carried on from the buyer's side, but the results hold for writers as well as buyers. The same will be true of the analysis which follows.
desirable, a high variance is undesirable, other things being equal. While a trader will not assume an intermediate position to increase his expected profits, as we have seen, he may do it to reduce the variance of his market position.

To show this, let us first obtain the variance of (6), the returns function. We can get it immediately, using (3), as

\[ \sigma_c^2 + k\sigma_x^2 = \sigma_c^2 + k^2 \sigma_x^2 + 2k \rho \sigma_c \sigma_x, \]

where \( \rho \) is the correlation coefficient between the returns from buying a call and from selling stock. For any given distribution, \( f(x) \), of expected prices, all the variances (and standard deviations) can be computed and are constants. Thus (9) is a parabola in \( k \). The position of minimum variance can be found by differentiation, or

\[ \frac{d}{dk} \sigma_c^2 + k\sigma_x^2 = 2\sigma_x^2 k + 2 \rho \sigma_c \sigma_x. \]

If this expression is set equal to zero and solved for \( k \), we get the minimum-variance \( k \), which is

\[ k = -\frac{\rho \sigma_c}{\sigma_x}. \]

The \( k \) which satisfies (10) must lie between zero and positive one. For this to be true, two relationships must hold: \( \sigma_x \geq \sigma_c \), and \( \rho \) must lie between -1 and 0. We have already demonstrated that the

\[ \frac{d^2}{dk^2} \sigma_c^2 + k\sigma_x^2 = 2\sigma_x^2, \]

is necessarily positive.

---

7This is a minimum point and not a maximum, inasmuch as the second derivative,
first relationship holds. By definition $\rho$ cannot exceed unity in absolute value. We will give a graphical demonstration that it is negative. Figure 2 portrays the locus of all possible combinations of gains to be had from selling stock and buying a call. The least-squares regression lines which would best fit the locus obviously have negative slope. And so the correlation coefficient would be negative, and the minimum-variance $k$ must lie between zero and positive one.

From (10) we can deduce the nature of the price expectations if the minimum variance were to occur at either of the extremes, $k = 0$ or $k = 1$. For (10) to equal unity, $\sigma_x = \sigma_c$, which can only happen if the probability of a fall in price is zero. For (10) to equal zero, $\sigma_c = 0$, which can only happen if the probability of a price rise is zero. Needless to say, under any realistic conditions these requirements would not be fulfilled.

If the probability distribution which characterizes future prices is symmetrical around $x_o$, the present price, the minimum-variance $k$ will equal 1/2, the straddle position. To demonstrate this a slightly different approach will be taken. Assume that all the option positions are reached by purchasing mixtures of puts and calls rather than by buying a call and then converting. Thus

$$
(1 + g)\begin{bmatrix} 1 \\ 0 \end{bmatrix} + (1-g)\begin{bmatrix} 0 \\ 1 \end{bmatrix},
$$

where $-1 \leq g \leq +1$, describes all possible option positions. If $g = 0$, the position is the straddle one; if $g = -1$, it is the position of two puts; and if $g = +1$, two calls. Using (3) again, we get

$$
\sigma^2(1 + g)c + (1 - g)p = (1 + g)^2 \sigma_c^2 + (1 - g)^2 \sigma_p^2 + 2(1 + g)(1 - g)\rho \sigma_c \sigma_p
$$
Figure II. Possible Gains from Simultaneous Purchase of Call and Sale of Stock
for the variance of the expected returns. To get the minimum variance, we differentiate with respect to \( g \) and set the result equal to zero. We obtain

\[
(11) \quad g = \frac{\sigma_p^2 - \sigma_c^2}{\sigma_p^2 + \sigma_c^2}
\]

If \( f(x) \) is symmetrical, \( \sigma_p^2 = \sigma_c^2 \), and the minimum variance \( g = 0 \). This corresponds to \( k = 1/2 \).

We have now demonstrated that in maximizing his expected profit, an option trader would assume an initial position, one where \( k = 0 \), \( 1/2 \), or \( 1 \). In any realistic circumstances, the variance of expected profits will not be a minimum at \( k = 0 \) or \( 1 \), it will be somewhere in between. If expected prices form a symmetric probability distribution around the present price, the variance of expected profits will be a minimum at \( k = 1/2 \). In general, if an option trader is willing to substitute some expected profit for a reduced variance, the option position he assumes in doing so may be an intermediate position, one other than \( k = 0, 1/2, \) or \( 1 \).

It is principally the writers who assume these intermediate positions. While investors who purchase options for insurance purposes seek a reduced variance, they limit themselves to the lower variance that one of the "initial" positions affords; they do not go to the intermediate positions. Nor do the speculative buyers of options, of course. But the writers — at least some of them — do. They may, for example, write ten calls and purchase 700 shares of stock for protection, or they may have 1000 shares of stock against which they have written fifteen straddles, etc. As one writer told the author, "To make money
in this business you have to be over-extended." That is, in his view, it is wise (and perhaps necessary) not to have one's position converted to either extreme: neither sell all puts nor all calls, but have one's option commitments somewhere in between. From the fact that writers behave in this manner, I conclude that option writers are more sensitive to variance than option buyers.

This fact should not be surprising. Because of the nature of the writer's gain function, large variance can mean very large losses which cannot be balanced by very large gains. The essence of writing is that one is started off at some point in time with a modest profit - the premium which the writer receives - and then one must protect himself as best he can from preventing subsequent market price movements from eroding away this profit. The large erosions come from large price swings. Hence the sensitiveness to variance. Stated somewhat differently, the writer enters into contracts from which his expected gains have large variances. Inasmuch as the variability in price movements means losses, there are strong pressures for keeping his total variance from becoming any larger than necessary.

The possibility of trading both in securities and in options upon these securities has some interesting implications for the theory of asset preferences. The usual procedure of analysis is to assume, on the basis of price expectations, an expected return and a

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8 There are income-tax pressures to behave this way as well.

variance of that expected return for each security under examination. On the basis of these expected parameters it is possible to obtain a locus of "efficient" combinations of investments in these securities. These are efficient in the sense that for the varying levels of expected gain from the entire portfolio, the efficient combinations are those which provide the least variance. The investor can then choose from the efficient combinations according to the dictates of his preferences for expected gain and its variance.

In our analysis of the last few pages we have seen, however, that by combining option positions and stock positions in the same security it is possible to get varying expected gains and variances from the total position in that security. So with options, there is not just one expected gain with its variance in each security, rather there are a number of combinations of expected gain and variances. From all these possible combinations we can get a locus of combinations which are "efficient-in-the-subset." These would be the combinations which for varying levels of expected gain in that security would give the least variance. There will be an efficient-in-the-subset locus for each security upon which options can be purchased. Thus if asset-preference analysis is to include the trading in options on securities, the building blocks from which the over-all, or "efficient-in-the-large," locus of investment combinations is constructed cannot be a single expected gain and a single variance for each security. The building blocks must be the efficient-in-the-subset loci for the various individual securities. Thus the existence of option trading adds a new complexity to asset-preference analysis.
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BIOGRAPHICAL NOTE

The author, Richard John Kruizenga, was born in Spring Lake, Michigan, on September 25, 1930. Except for a brief sojourn in Homewood, Illinois, during the depths of the Great Depression, he was reared in Spring Lake and attended public school there through the tenth grade. He graduated from Grand Haven (Michigan) High School in 1948. He thereupon matriculated at Hope College, Holland, Michigan. He majored in economics and obtained an A.B. degree.

Mr. Kruizenga began graduate work in the Department of Economics at the Massachusetts Institute of Technology in 1952. General examinations for the doctoral degree were taken in the spring of 1954. During the academic year 1954-55 he served as Teaching Assistant in the department and the following year as a half-time Instructor.

On September 6, 1952, Mr. Kruizenga married Margaret Feldmann of Lake Success, New York. On March 1, 1955, a son, Derek, was born to them.